INSTALLATION RESTORATION PROGRAM

Site Investigation Report

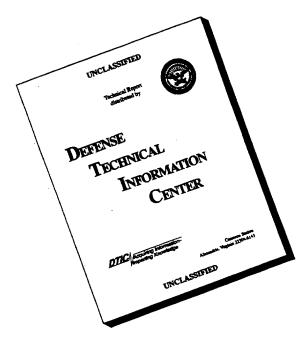
SITE INVESTIGATION FOR 125th FIGHTER INTERCEPTOR GROUP FLORIDA AIR NATIONAL GUARD



HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Environmental Restoration and Waste Management Programs
Oak Ridge, Tennessee 37831-7606
managed by MARTIN MARIETTA ENERGY SYSTEMS, INC.

for the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-84OR21400

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INSTALLATION RESTORATION PROGRAM

SITE INVESTIGATION FOR

125TH FIGHTER INTERCEPTOR GROUP FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

SITE INVESTIGATION REPORT MARCH 1995

PREPARED FOR

NATIONAL GUARD BUREAU ANDREWS AIR FORCE BASE WASHINGTON, D.C. 20331

PREPARED BY
CH2M HILL

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ACRONYMS

AGE Aerospace Ground Equipment

ARAR Applicable or Relevant and Appropriate Requirements

BCF bioconcentration factor bls below land surface DD decision document

DI daily intake

EDB ethylene dibromide

EPA Environmental Protection Agency FAC Florida Administrative Code FANG Florida Air National Guard

FDER Florida Department of Environmental Regulation

FID flame ionization detector

FTA fire training area

HAZWRAP Hazardous Waste Remedial Actions Program

IRIS Integrated Risk Information System

JBES Jacksonville Department of Bio-Environmental Services

IRP Installation Restoration Program

K hydraulic conductivity

MCL Maximum Contaminant Level MCLG Maximum Contaminant Level Goal

mg/kg milligrams per kilogram
mg/l milligrams per liter

µg/l micrograms per liter

MW monitor well

NGB National Guard Bureau
OVA organic vapor analyzer
OWS oil/water separator

PCB polychlorinated biphenyls

ppm parts per million
PVC polyvinyl chloride
QC quality control
RfD reference dose
SI Site Investigation

SITM Site Investigation Technical Memorandum

SPT standard penetration test

SST stainless steel

TDS total dissolved solids
TOC total organic carbon
TSS total suspended solids

USGS United States Geological Survey

UST underground storage tank VOA volatile organic aromatic

WP well point

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A two-step Site Investigation (SI) was conducted to evaluate the nature and extent of environmental contamination that might have resulted from past activities at eight disposal/spill sites at the 125th Fighter Interceptor Group, Florida Air National Guard (FANG) in Jacksonville, Florida. The sites included in the SI are shown on the location map in Figure ES-1 and briefly described below:

Site No.	Description
1	Oil/water separator (OWS) inlets along the aircraft parking
	apron
3	Subsurface of aircraft parking apron
J	Fire training areas, separated for clarity into Site 3E for the east area and Site 3W for the west area
4	OWS at the Hush House
5	OWS at the Vehicle Maintenance Building
6 7	Area outside the Munitions Building Trim pad for aircraft run-up
8	OWS at the Wash Rack

The first step of the SI involved installation and sampling of 52 temporary well points at the sites, organic vapor headspace analyses of soil samples, and cone penetrometer testing. Each well point was also checked for floating hydrocarbons before sampling. The work provided a preliminary screening to assess whether past site activities had resulted in contamination of groundwater or soils at the sites or of surface water or

sediments in a drainageway system that runs throughout FANG. The data collected were analyzed, validated, and reviewed to evaluate the need for and direction of further SI activities.

Soil organic vapor headspace analysis readings in excess of the 500-parts-per-million criterion established in Florida Administrative Code (FAC) Chapter 17-70 were exhibited in soil samples from Sites 1, 2, 3E, 4, and 8. Neither floating hydrocarbons nor hydrocarbon sheen was detected in any well points. Groundwater samples from well points at Sites 1, 2, 3E, 4, 5, 6, and 8 showed volatile organic concentrations in excess of either the maximum contaminant levels (MCLs) established by FAC Chapter 17-550 or the guidance criterion published by the Florida Department of Environmental Regulation. Semivolatile organics and polynuclear aromatics were detected at Sites 3E, 4, and 8, and lead and/or chromium criteria (50 µg/l) were exceeded in groundwater samples from Sites 1, 2, and 6. Soil samples showed no signs of polynuclear aromatics, ethylene dibromide, or polychlorinated biphenyls; only one soil sample (from Site 4) contained a volatile organic constituent (600 µg/kg total xylenes).

The drainageway system was investigated at four reaches during the first step of the SI through collection and analysis of surface water and sediment samples. Several volatile organics were detected in Reach 1 sediment samples, and silver and mercury were reported above the criteria established for Class III surface waters in FAC Chapter 17-3. Reach 2 surface water samples had concentrations of cadmium and chromium in excess of the Class III criteria. At Reach 3, lead levels appeared high and volatile organics were detected in sediment samples. Sediment and surface water samples at Reach 4 contained volatile and semivolatile organic constituents as well as high levels of lead, chromium, and cadmium.

Based on the results from the first step of the SI, the second step included further field activities at all of the sites, including soil organic vapor headspace analyses, additional temporary well point installation and sampling, monitor well installation and sampling, drainageway sampling, and aquifer testing to obtain data for estimating hydraulic conductivity. The data were analyzed and validated, then reviewed to assess the need for further site activities.

Soil organic vapor headspace analyses were conducted using equipment that differentiates methane from other organic vapors, to assess whether the high readings from the first step of the SI could be attributable to methane gas. The readings indicated that methane may be the dominant organic vapor in the soils at FANG.

Floating hydrocarbon measurements were taken in the monitor wells and well points installed for the second step of the SI. As for the previous field activities, no floating hydrocarbons or hydrocarbon sheen was observed.

At Site 1, chromium exceeding the 50- μ g/l standard was detected in two monitor well samples at concentrations of 112 and 152 μ g/l. Chromium was not reported in soil samples in excess of the background concentration. Volatile organics were not detected in the groundwater samples collected during the second step of the SI, so the concentrations reported during the first step may indicate localized contamination.

As part of the second step of the SI at Site 2, lead analyses were made on unfiltered and field-filtered groundwater samples from two new well points; concentrations were lower than had been reported during the first step of the SI. Lead concentrations ranged from 640 to 1,200 μ g/l during the first step as compared to 1.5 to 5.9 μ g/l during the second step. No volatile organic constituents were reported in the second step, indicating that any contamination is limited to the area beneath the parking apron.

Volatile organic constituents were again detected in groundwater samples from Site 3E (175 to 207 µg/l of total volatile organic aromatics) but in a localized area. The zone of contamination at this site appears to be isolated and may be relatively immobile as a result of site soil characteristics. No contaminants were detected at Site 3W in excess of governing criteria.

Because volatile organic concentrations were detected only at low levels at Site 4 during the first step of the SI (2 to 56 μ g/l of total volatile organic aromatics), no additional samples were collected in the subsequent field work.

Three monitor wells at Site 5 showed evidence of volatile organic contamination in excess of applicable standards, with a maximum total concentration of 65 µg/l, but

two were wells installed by others as part of an investigation of an underground storage tank. The lack of semivolatile organic constituents at the site, such as would be expected from the vehicle fluids used there, indicates the reported contamination may be attributable to the underground tank and not past site activities.

In initial sampling at one of the monitor wells installed for the second step of the SI at Site 6, chromium was detected at 128 μ g/l, in excess of the 50- μ g/l standard. Filtered and unfiltered samples from the Site 6 monitor wells and three additional well points were subsequently analyzed; while no chromium was detected in filtered samples, chromium was found above the standard in unfiltered samples from two well points. The data indicate that the chromium detected in groundwater samples at this site is associated with sediments in the samples. Paint spills at the site may be responsible for the presence of chromium, although the probable source is reported to have been removed through excavation of soils. Contaminants at this site could potentially migrate to an adjacent wetland area.

As in the first step of the SI, Site 7 groundwater samples collected during the second step showed no evidence of contaminants in exceedance of FAC standards or other guidance criteria.

Groundwater samples from the monitor wells at Site 8 did not show concentrations of contaminants in excess of applicable standards and criteria. The volatile organics reported during the first step (49 to 645 µg/l maximum total concentration) may indicate localized contamination at the OWS. The soil samples collected during monitor well installation did not indicate the presence of constituents that could be a continuing source of local groundwater contamination.

Sediment and surface water samples collected during the second step of the SI were obtained from drainageway locations downstream of FANG, and a background sediment sample was obtained from a point remote from the eight sites. Only barium was detected at a concentration significantly higher than background, no semivolatile organics were reported, and only one volatile organic was found above detection limits (chloroform at 1.5 µg/kg). Mercury was found in one surface water sample at 0.35 µg/l, in excess of the 0.20-µg/l Class III criterion, but no volatile or semivolatile organics were detected. The sources of the reported contaminants in the drainageway

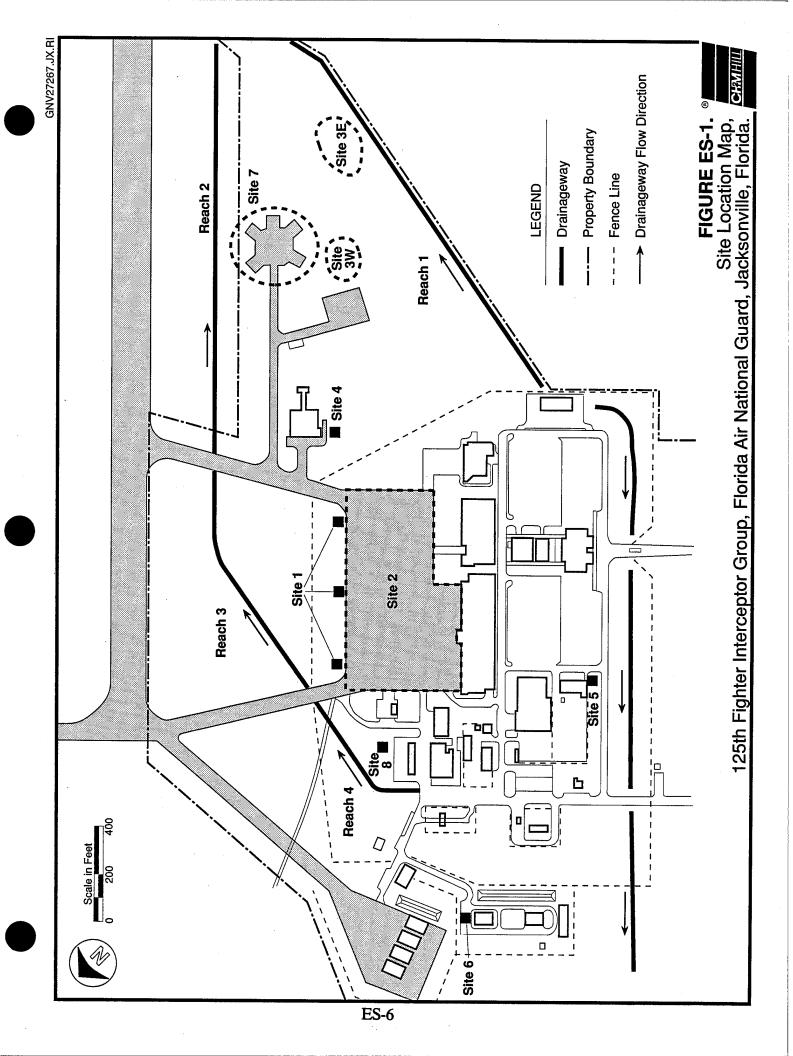
reaches at FANG and downstream of it are not clearly related to the eight sites and may be at least partially a result of current practices at FANG and runoff and discharges from Jacksonville International Airport.

A preliminary risk assessment was conducted to evaluate the potential human and environmental health hazards to both existing and potential future users of the FANG and adjoining properties. Current exposures are limited by access restrictions. Limited worker exposures to soils may occur during maintenance activities at the sites. Based on risk estimates, these exposures do not exceed acceptable risk levels.

Shallow groundwater is not used for drinking water, and future such usage may be restricted by low yields. Water quality may also be undesirable for potable use, as total dissolved solids and iron were reported at levels above secondary drinking water standards. Potential future use of the deeper aquifer near these sites as a potable water supply for base personnel was assumed to estimate reasonable maximum future exposures to groundwater contaminants. The Hazard Index was less than 1 for all sites, which indicates there is no non-carcinogenic risk from potential future ingestion of groundwater withdrawn in this zone. The highest lifetime cancer risk was 3×10^{-7} at Site 1. Carcinogenic risks are primarily attributed to benzene and arsenic. Arsenic concentrations were below MCLs in the shallow aquifer.

Mercury and arsenic detected in the drainageways are not likely to be a result of point source discharges from the sites. Elevated levels of mercury have been reported throughout Florida and appear to be associated with peat. Potential public exposures to surface water may occur at downstream locations where concentrations are estimated to be below criteria protective of human health.

Based on the results of the SI, no further action is recommended at Sites 1, 2, 4, 5, 6, 7, and 8 and decision documents will be prepared. No further action is recommended at Site 3W and continued groundwater monitoring of MW 3E-1 is recommended at Site 3E. A decision document for Site 3 will be prepared. The OWS at Site 5 does not appear to be the major source of the contamination reported there and further action at this site under this program is not recommended. The underground storage tank is being investigated separately.



SECTION 1Introduction

1. INTRODUCTION

The Hazardous Waste Remedial Actions Program (HAZWRAP) is assisting the National Guard Bureau (NGB) in identifying, investigating, and remediating environmental contamination through the Installation Restoration Program (IRP). CH2M HILL has been assigned under General Order 13B-97385C, Task Order Authorization No. Y-05, to investigate eight disposal/spill sites at the 125th Fighter Interceptor Group, Florida Air National Guard (FANG) in Jacksonville, Florida (see Figure 1-1), and to determine whether remediation is required. NGB is committed to resolving the status of past disposal/spill sites as quickly as possible.

1.1 SCOPE

The only information available on the potential contamination at the eight disposal/spill sites before the Site Investigation (SI) began was the *Installation Restoration Program, Phase I, Records Search, 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville International Airport, Jacksonville, Florida,* by the Hazardous Materials Technical Center¹. The Phase I Records Search provided a basis for developing the scope of the SI, which incorporated some of the tasks normally performed in a remedial investigation. The SI was conducted in two steps to collect the data that would support an evaluation of the nature and extent of contamination of local groundwater, soil, surface water, and sediments.

The primary purpose of the first step was to obtain data for a preliminary assessment of the nature and extent of contamination at each site and of the potential risks to human health and the environment. The second step of the SI focused on collecting more detailed data on the extent of contamination at the sites identified in the first step as requiring further information. Except as noted in this report, all SI work was performed in accordance with the Site Investigation Sampling and Analysis Plan² prepared by CH2M HILL in March 1989, revised in June 1989, and finalized in October 1989.

The first step of the SI was conducted from May 22 through June 23, 1989, and included temporary well point installation; soil organic vapor analyses; cone penetrometer testing; groundwater, soil, and drainageway sampling; a preliminary hydrogeologic assessment; and a preliminary receptor survey. Samples collected during the field activities were submitted for laboratory analysis during and following that period. The *Site Investigation Technical Memorandum* (SITM)³ was prepared summarizing the results of the first step of the SI.

Field activities for the second step of the SI were conducted from November 27 through December 5, 1989, and included installation of additional temporary well points and monitor wells; soil, groundwater, and drainageway sampling; aquifer testing; and abandonment of all the well points installed during the SI. The sampling locations and parameters analyzed in the second step of the SI were based on the results of the first step. Additional well point installation and sampling were performed as a result of comments on the SITM³ provided by the Florida Department of Environmental Regulation (FDER).

1.2 BACKGROUND

The Phase I Records Search (now called a Preliminary Assessment) was completed for FANG in July 1987 by the Hazardous Materials Technical Center¹. Seven past disposal/spill sites were identified and five were recommended for further study. At the request of FDER and the direction of the NGB, all seven sites and one additional site were addressed in the SI.

1.3 INSTALLATION DESCRIPTION

FANG is staffed by the 125th Fighter Interceptor Group, whose mission is to provide immediate response (within 5 minutes) 24 hours a day if an unidentified aircraft enters the airspace of the United States from the east coast of Florida. The primary type of fighter plane now used at FANG is the F-16. The installation is located next to the western edge of Jacksonville International Airport, approximately 10 miles north of the center of the City of Jacksonville, and uses the airport runway (see Figure 1-2). FANG is relatively small, with approximately

30 buildings on 332 acres, and has been active continuously since it was constructed in 1968 on undeveloped swampy land.

The region in which FANG is located is characterized by high annual precipitation (over 50 inches per year). The water table is shallow and has been observed to be at or near land surface during the wet season in some areas. The major source of local drinking water, the Floridan aquifer, occurs about 300 feet below land surface (bls). Soils are fine-grained and moderately to poorly drained, with relatively low permeability. Several surface drainageways and swampy groundwater discharge areas are present at FANG (see Figure 1-3).

1.4 SITE HISTORY

The following eight disposal/spill sites at FANG were included in the SI:

Site No.	Description
1	Oil/water separator (OWS) inlets along the aircraft parking apron
2	Subsurface of aircraft parking apron
3	Fire training areas (FTAs), separated for clarity into Site 3E for the east area and Site 3W for the west area
4	OWS at the Hush House
5	OWS at the Vehicle Maintenance Building
6	Area outside the Munitions Building
7	Trim pad for aircraft run-up
8	OWS at the Wash Rack

Past activities at each site that may have led to environmental contamination are briefly described below.

1.4.1 Site 1. Oil/Water Separator Inlets Along the Aircraft Parking Apron

Site 1 consists of the areas surrounding three OWS inlets at the northern edge of the FANG aircraft parking apron. The inlets drain to an OWS to the north that discharges into a nearby surface drainageway. The inlets must be opened manually to collect surface runoff and fuel spills. Reportedly, the inlets have not always been opened when a spill occurred, which allowed runoff to flow over and around them into a grassy area to the north.

Runoff is reported to have contained spilled fuels (e.g., JP-4), solvents, and cleaners. Spills of up to 100 gallons of JP-4 reportedly occurred frequently. The F-106 planes used at FANG from 1974 to early 1987 reportedly leaked large quantities of fuels.

1.4.2 Site 2. Subsurface of Aircraft Parking Apron

When a trench was excavated through the concrete aircraft parking apron in 1980 or 1981 to repair electrical conduit, workers were reportedly overcome by fumes. Respiratory protection was necessary for the workers to finish repairing the electrical conduit and patching the concrete. Because there are no known underground fuel storage tanks or fuel supply lines underneath the parking apron, seepage of fuel spills through pavement joints is the suspected source of contamination.

1.4.3 Site 3. Fire Training Areas

Site 3 is located in the eastern portion of FANG and includes two shallow, unlined, earthen pits used for fire training from 1968 to 1984, when fire training activities at FANG ceased. The easternmost FTA (Site 3E) was used most recently, from the mid-1970s until 1984. The original FTA to the west (Site 3W) was used from 1968 to the mid-1970s.

Three to four 55-gallon drums of flammable liquids, including JP-4, spent solvents, used oils, and slop wastes, were reportedly burned during each fire training exercise.

1.4.4 Site 4. Oil/Water Separator at the Hush House

Site 4 consists of the area surrounding an OWS on the south side of the Hush House. The OWS is located in the eastern section of FANG and discharges to a nearby surface drainageway. When F-106 planes were being used at the installation, the large quantities of fuel that leaked from these aircraft reportedly caused the OWS to overflow. Waste fuel, solvents, and oil have reportedly been discharged to the OWS and overflowed into the nearby drainageway.

1.4.5 Site 5. Oil/Water Separator at the Vehicle Maintenance Building

Site 5 is located at the southern edge of FANG, south of the Vehicle Maintenance Building and next to a surface drainageway. The site consists of the area surrounding the OWS, which is designed to collect drainage and spills from the floor drain of the Vehicle Maintenance Building. Materials used during maintenance that could have drained into the OWS include oil, fuel, transmission fluid, solvents, and battery electrolyte. No major spills have been reported at this site. The nearby drainageway appears to contain water only when it rains.

1.4.6 Site 6. Area Outside the Munitions Building

The Munitions Building is at the western edge of FANG. Between approximately 1968 and 1980, small amounts of solvents, lacquer thinner, and paint were reportedly poured on the ground next to the back door of the building. Approximately 5 years ago, about 6 inches of soil visibly contaminated with paint were excavated and removed.

1.4.7 Site 7. Trim Pad for Aircraft Run-Up

The concrete trim pad is located in the eastern portion of FANG, near the FTAs at Site 3, and has been used for trimming jet engines since the installation was constructed in 1968. A surface drainageway runs along the northern edge of the site. During the period when F-106 planes were used, JP-4 frequently leaked onto the trim pad during aircraft run-up. Spills of up to 400 gallons of fuel reportedly occurred and were washed off the pad with fire hoses.

1.4.8 Site 8. Area Surrounding Oil/Water Separator at the Wash Rack

Various solvents and cleaners have been used at the Wash Rack, a building located west of the aircraft parking apron. An OWS to the west of the building receives flows from its floor drain and discharges into a nearby surface drainageway. The OWS also receives drainage from the nearby Aerospace Ground Equipment (AGE) Storage Building, where generators are kept. Fuel, transmission fluid, and oil may have been discharged to the OWS from these buildings. The OWS has overflowed in the past.

Before the OWS was constructed around 1980, two man-made separation ponds were in use at this site. The ponds were filled and the OWS was built on top of one of them.

1.5 APPLICABLE REGULATORY GUIDELINES

Federal standards, requirements, or criteria that are Applicable or Relevant and Appropriate Requirements (ARARs) will be applied unless state ARARs are more stringent. State regulations applicable to the type of contamination expected to be found at the sites have been identified, but the agencies will continue to be consulted to ensure all requirements are met.

The shallow groundwater at FANG falls within the classification of a G-II aquifer as defined in Florida Administrative Code (FAC) Chapter 17-3. As a result, evaluation of the condition of the groundwater must be based on state drinking water standards. The drinking water standards specified in FAC Chapter 17-550

(formerly FAC Chapter 17-22) were derived from federal standards and are summarized in Table 1-1. FAC Chapter 17-70 addresses petroleum contamination site cleanup criteria; target concentrations from petroleum contaminants in groundwater are summarized in Table 1-2. An internal 1989 FDER guidance document⁴ will also be used to evaluate groundwater contamination at FANG.

Soil hydrocarbon contamination is addressed in FAC Chapter 17-70; the criterion for soil contamination under FAC Chapter 17-70.003 is based on headspace analysis of soil using an organic vapor analysis (OVA) instrument with a flame ionization detector (FID) in survey mode. Following the procedure outlined in Chapter 17-70.003, soil is considered excessively contaminated if the reading on the analytical instrument is greater than 500 parts per million (ppm).

General water quality criteria for all surface waters are listed in FAC Chapter 17-3.061, while Chapter 17-3.121 provides criteria for Class III surface waters. The surface waters in the drainageways at FANG are considered Class III, which is defined as waters used for recreation and propagation and maintenance of a healthy, well balanced population of fish and wildlife. Applicable surface water quality criteria are listed in Table 1-3.

Table 1-1 SUMMARY OF FAC CHAPTER 17-550 DRINKING WATER STANDARDS (FORMERLY FAC CHAPTER 17-22)

Primary Drinking Water Standard	Maximum Contaminant Level (MCL)
Inorganics	
Arsenic	0.05 ma/l
Barium	0.05 mg/l
Cadmium	1 mg/l 0.010 mg/l
Chromium	
Fluoride	0.05 mg/l
Lead	4.0 mg/l
Mercury	0.05 mg/l
	0.002 mg/l
Nitrate (as N) Selenium	10 mg/l
Silver	0.01 mg/l
	0.05 mg/l
Sodium	160.0 mg/l
Turbidity	1.0 NTU ^a
Pesticides	
Endrin	2 μg/l
Lindane	4 μg/l
Methoxychlor	100 μg/l
Toxaphene	5 μg/l
2,4-D	100 μg/l
2,4,5-TP (Silvex)	100 μg/l
	10 µg /1
Coliform Bacteria ^b	1 colony/100 ml
Radionuclides	
Combined Radium 226 & 228	5 pCi/l
Gross Alpha	15 pCi/l
Beta and Photon Radioactivity	F
(Man-Made Radionuclides)	4 millirem/year
Total Trihalomethanes	0.1 mg/l
(Sum of Bromoform, Bromodichloromethane,	g, 1
Dibromochloromethane, Chloroform)	
Volatile Organics	
Trichloroethene	2 - 1
Tetrachloroethene	3 μg/l
renacmoroemene	3 μg/l

Table 1-1 (continued)

Primary Drinking Water Standard	Maximum Contaminant Level (MCL)
Volatile Organics Carbon Tetrachloride Vinyl Chloride 1,1,1-Trichloroethane 1,2-Dichloroethane Benzene Ethylene Dibromide p-Dichlorobenzene 1,1-Dichloroethene	3 μg/l 1 μg/l 200 μg/l 3 μg/l 1 μg/l 0.02 μg/l 77.5 μg/l
Secondary Drinking Water Standard Chloride Color Copper Corrosivity Foaming Agents Iron Manganese Odor pH (at collection point) Sulfate Total Dissolved Solids Zinc	250 mg/l 15 color units 1 mg/l -0.2 to +0.2 Langelier index ^c 0.5 mg/l 0.3 mg/l 0.05 mg/l 3 (threshold odor number) 6.5 - 8.5 250 mg/l 500 mg/l ^d 5 mg/l

^aMCL is 5 NTU for average of 2 consecutive days or longer if proven to not reduce water quality.

^bFor membrane filter technique, one/100 ml is the average per sampling period. Four/100 ml in more than one sample if 20 samples or less are analyzed per sampling period; four/100 ml in more than 5% of samples if 20 samples or more are analyzed per sampling period.

^cMay be different if stabilizers are used.

 $^{^{\}rm d}$ More than 500 mg/l is acceptable if no other MCL is exceeded.

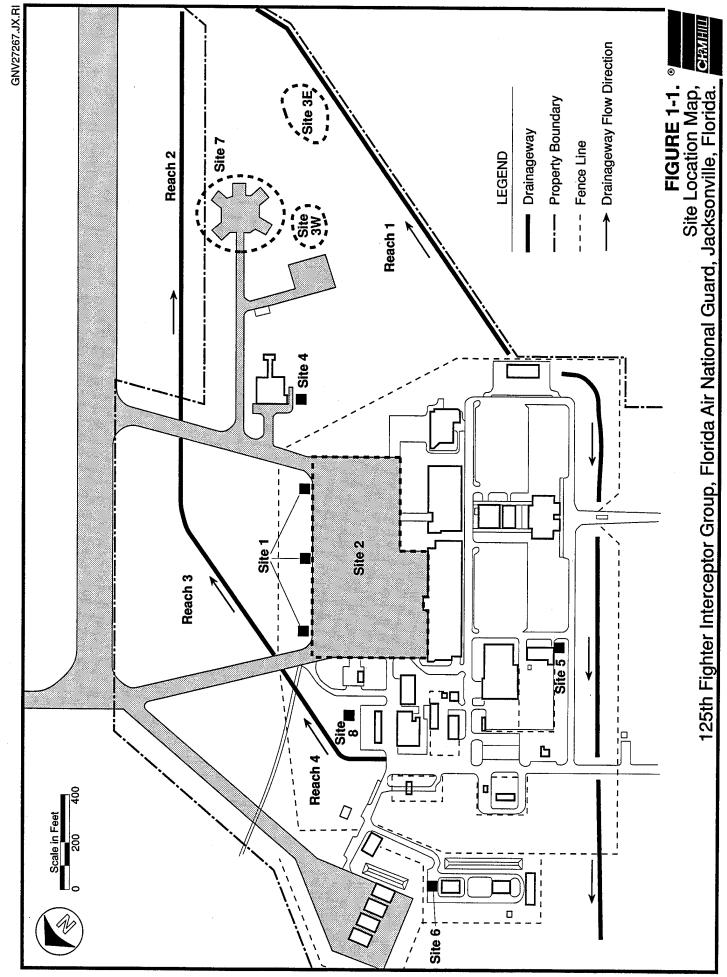
Table 1-2
FAC CHAPTER 17-70.011 TARGET CONCENTRATIONS
FOR GROUNDWATER CLEANUP

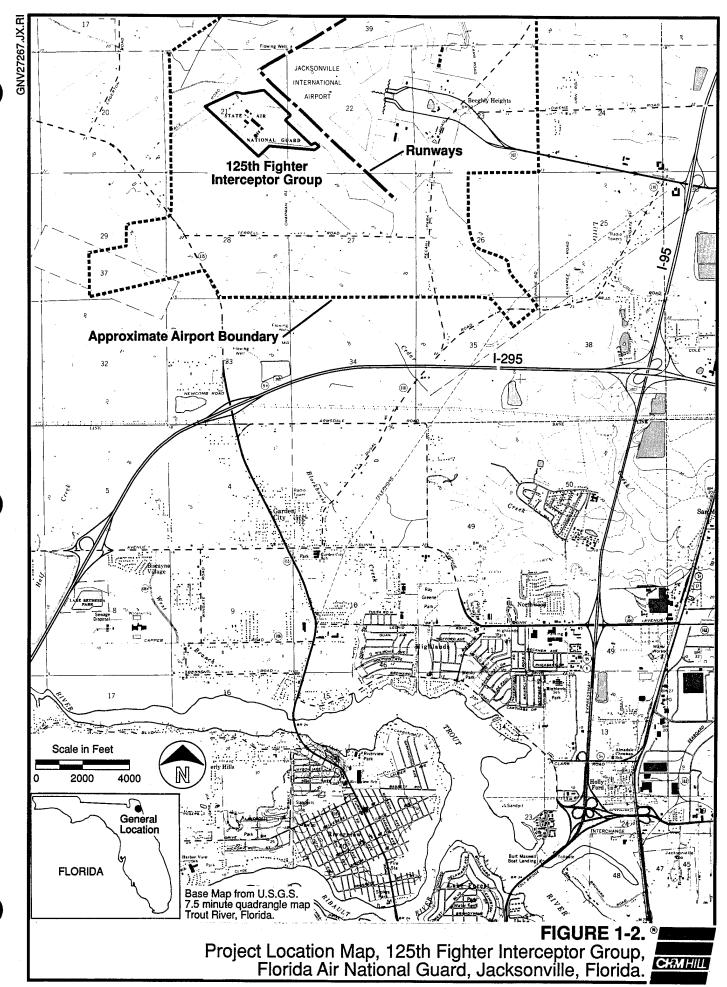
Contaminant	Concentration (in µg/l)
Benzene	1.0
1,2-Dichloroethane	3.0
1,2-Dibromoethane (EDB)	0.02
Total Volatile Organic Aromatics	50.0
Lead	50.0
Polynuclear Aromatic Hydrocarbons (excluding Naphthalenes)	10.0
Total Naphthalenes	100

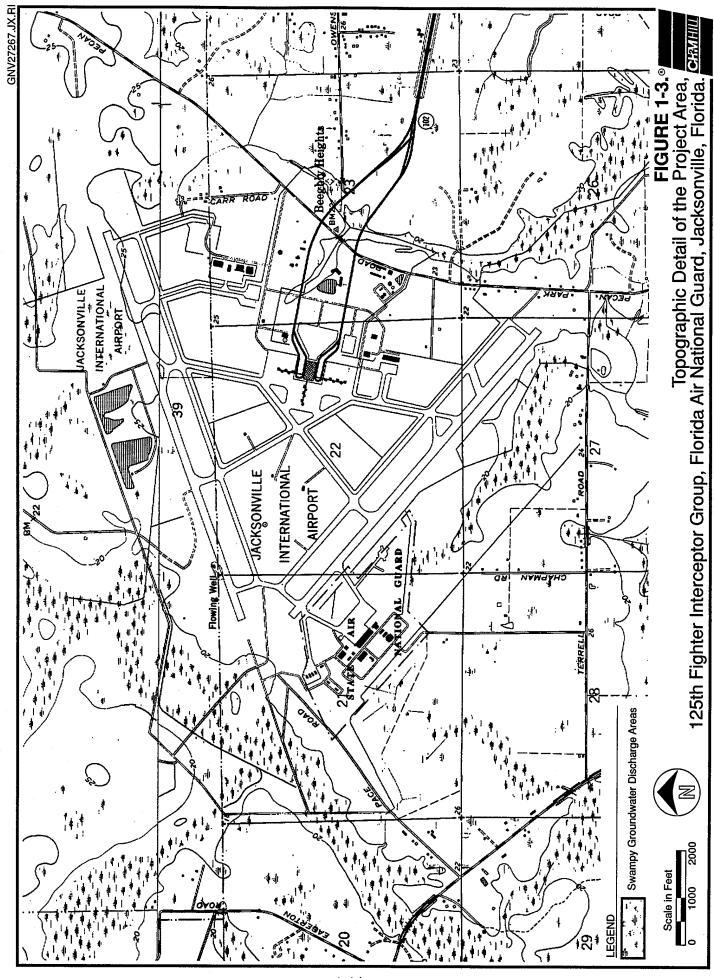
Table 1-3
SUMMARY OF FAC CHAPTER 17-3 SURFACE WATER CRITERIA

General Criteria	
(FAC Ch. 17-3.061)	MCL
Arsenic	0.05 mg/l
Chromium	0.05 mg/l
Lead	0.05 mg/l
Phenolic Compounds	1.00 µg/l
	_
Class III Criteria	
(FAC Ch. 17-3.121)	MCL
C- d	0.0000 0.0040 #3
Cadmium	0.0008 - 0.0012 mg/la
Mercury	0.0002 mg/l
Mercury Selenium	0.0002 mg/l 0.025 mg/l
Mercury Selenium Silver	0.0002 mg/l 0.025 mg/l 0.00007 mg/l
Mercury Selenium Silver Polychlorinated Biphenyls	0.0002 mg/l 0.025 mg/l 0.00007 mg/l
Mercury Selenium Silver	0.0002 mg/l 0.025 mg/l 0.00007 mg/l
Mercury Selenium Silver Polychlorinated Biphenyls	0.0002 mg/l 0.025 mg/l 0.00007 mg/l 0.000001 mg/l

^aCriterion is 0.0008 mg/l for predominantly fresh waters with a hardness of less than 150 and 0.0012 mg/l in harder waters.







SECTION 2Field Activities

2. FIELD ACTIVITIES

The primary objectives of the SI were to determine whether past site activities have resulted in significant contamination of soil, groundwater, surface water, and sediments; to assess the potential impacts of the contamination on human health and the environment; and to recommend the course of further IRP activities. A two-step approach, in which the results of initial field work were used to direct subsequent efforts toward sites most likely to require remediation, was implemented to meet the objectives. With the review and approval of NGB, HAZWRAP, and FDER, this approach has provided the flexibility to adjust the SI based on observed field conditions. The approach has also allowed timely handling of individual sites through the IRP process.

The activities performed during the two steps of the SI are described in detail in the following subsections. A summary of all SI field activities is shown in Table 2-1.

2.1 FIRST STEP OF THE SITE INVESTIGATION

The primary objective of the field work performed as part of the first step of the SI was to assess whether past site activities have resulted in contamination of soil, groundwater, surface water, and/or sediments. Major field tasks included temporary well point installation, water level measurements, soil organic vapor headspace analyses, cone penetrometer testing, and sampling of groundwater, soils, and drainageway surface water and sediments.

2.1.1 Temporary Well Point Installation

A construction diagram for a typical temporary well point is presented in Figure 2-1. As described in the *Site Investigation Sampling and Analysis Plan*², the main purposes for installing temporary well points were to assess the presence and extent of floating hydrocarbon contamination in shallow groundwater and to evaluate the extent of dissolved groundwater contamination. The total number of well points needed, therefore, would depend primarily on the amount of floating

hydrocarbons found, and it was initially anticipated that up to 80 well points could be installed to adequately assess the eight sites. However, no floating hydrocarbons were detected in the initial well points installed at any of the sites, so fewer were needed to satisfy the purposes of the investigation. In total, 52 temporary well points were installed at the eight sites at FANG, as shown on the large map provided as Attachment 1. The total includes the 51 well points originally installed and a replacement well point at a site that experienced flooding from surface drainage.

Most of the soils encountered at the sites during well point installation were fine grained, dense silty to clayey sands. While the soils were relatively easy to penetrate with the hand auger used for installation of the polyvinyl chloride (PVC) well points, field personnel suspected that the procedure intended for Site 2, the aircraft parking apron, might be difficult. A test attempt at Site 8 to implement the procedure, which at Site 2 would involve driving smaller diameter stainless steel (SST) well points into the soils underlying the parking apron, confirmed the difficulty. In addition, with the compacted soil under the parking apron, it was felt that the smaller diameter SST well points would not allow a sufficient quantity of recharge for all samples to be collected in 1 day.

Because the well points in the parking apron had to be installed, sampled, and removed as quickly as possible, a decision was made to use the PVC well points instead of the SST equipment. To facilitate installation, 4-inch diameter holes were cored through the aircraft parking apron so that the 3-inch diameter hand auger could be used. The 2-inch diameter PVC well points were then installed at five locations in the parking apron. The 1.5-inch diameter SST well points were installed at six locations around the edge of the parking apron. Soil cuttings from all boreholes in the apron at Site 2 were collected in a wheelbarrow and transported away from the apron. The area surrounding the borehole was then swept clean of remaining debris.

2.1.2 Cone Penetrometer Testing

On May 30, 1989, In-Situ Technology, Inc., a specialty subcontractor, performed one piezocone penetration near well point (WP) 1-2 at Site 1 to obtain data on

the generalized geologic subsurface conditions at FANG. One hydrocone test was also performed to estimate the hydraulic properties of the surficial aquifer material. The piezocone methodology is described in detail in the *Site Investigation Sampling and Analysis Plan*² but can be simply explained as indicating soil density through point stress and soil cohesiveness through friction. Clayey soils tend to display higher friction and lower point stress, while sandy soils are indicated by higher point stress and lower friction. Pore pressure readings indicate the depth below the water table and possible zones of confined groundwater.

The piezocone was pushed until a dense zone was encountered at a depth of 90 feet bls. The hydrocone test was performed next to the piezocone penetration to determine local aquifer characteristics at 7 feet bls (3 feet below the water table). Section 3.1 discusses the results of the cone penetrometer testing.

2.1.3 Groundwater Sampling

Because there were fewer well points and no apparent floating hydrocarbons, a decision was made to obtain groundwater samples from all of the well points. On June 2, 1989, several well points were purged by bailing to evaluate the time required for sufficient recharge for sampling. The well points were found to bail dry after yielding less than 2 gallons of water, and they recharged so slowly that they could not be sampled on the same day they were purged. Therefore, all well points were purged in 1 day and allowed to recharge for 2 days before sampling. Despite this plan, some well points had to be sampled two to three times to obtain a sufficient volume for all the analyses desired. In such cases, samples were collected the first day for volatiles, the second day for metals, and the third day for semivolatiles.

At Site 2, groundwater samples were obtained only from selected well points and only for volatile organics and lead analyses. This restricted coverage was necessary because of the difficulty in obtaining sufficient sample volumes and the limited time available for field work on the aircraft parking apron. The well points installed through the apron were removed after 2 days and the holes patched. The SST well points on the perimeter of the apron were slow to recharge and produced very silty water.

Heavy rainstorms during the sampling period caused surface flooding in several areas at FANG. Surface water filled some well points in those areas, because the annular space between the casing and the borehole of a well point is not sealed with grout (as for a permanent monitor well). Well points WP 1-1, 3W-5, 7-2, and 7-5 were flooded before any samples could be obtained. WP 3E-7, 5-1, and 5-2 were flooded after samples were obtained for volatiles analysis but before other parameters were sampled.

Soil headspace data and field observations indicated that contamination was likely at WP 1-1, so WP 1-1A was installed to obtain confirming groundwater samples. For Sites 3W and 7, the coverage provided by the remaining well points and the information obtained from headspace analysis and visual observations were felt to be sufficient for the purposes of this part of the SI. Because samples for analysis of volatiles, which are the selected indicators for contamination, had been obtained prior to the flooding of other well points, the lack of samples for other parameters was not considered significant.

2.1.4 Soil Sampling

Organic Vapor Analyses

Soils removed from all the boreholes during well point installation were screened for hydrocarbon contamination through identification of visible staining or the presence of fuel odors. The observations and estimated depth to the water table were the basis for selecting at least one soil sample from most of the boreholes for headspace analysis with an OVA; in total, 54 soil samples were analyzed with the OVA. Per FAC Chapter 17-70, each soil sample was collected by half filling a 16-ounce jar, which was covered with aluminum foil and brought to a constant temperature in a water bath. An OVA with an FID was used to measure the concentration of total organic vapors in the headspace above the soils in each jar.

Laboratory Analyses

The results of the OVA readings and field observations during well point installation were considered in selecting the locations and depths for collecting soil

samples for laboratory analyses. The 21 sample locations are shown in Attachment 1; 27 samples in total were collected, as samples were taken at different depths at some locations and three duplicate samples were collected. The samples were collected with a hand auger from boreholes made within 2 feet of the associated well point.

Soil samples for volatile organics analysis were collected from all well point locations where OVA readings exceeded 500 ppm, except at Site 2. Because all well points within Site 2 were either within or directly adjacent to the concrete parking apron, where soil excavation is not considered feasible, soil contamination was not felt to be an issue.

2.1.5 Drainageway Sampling

For each of the four drainageway reaches at FANG, sediment samples were obtained from three locations and surface water samples from one location, as shown in Attachment 1. All drainageway samples were obtained after an extended period of dry weather (prior to any of the rainfall that occurred during the field work). As a result, analyses would not be affected by rainfall dilution and should reflect the highest concentrations of contaminants likely to be present. Drainageway sampling was performed before well point sampling.

Additional sediment samples (1 C.O. and 1 M.O.) were obtained from two locations in a small drainage ditch connected to the OWS inlet at the north end of the aircraft parking apron in the vicinity of WP 1-5 (see Attachment 1, location OWS-1). The samples were taken to investigate the possibility that surface drainage had been bypassing the OWS inlet and discharging directly into Reach 3 through this drainage ditch. Because the ditch was dry, only sediment samples could be obtained.

One sediment and one water sample were also obtained from the Site 4 OWS outfall (denoted as OWS-4 on Attachment 1), as it appeared from field observations that fuel contaminants had been discharged into this area.

2.2 SECOND STEP OF THE SITE INVESTIGATION

The results of the first step of the SI, the preliminary hydrogeologic assessment, and the preliminary risk assessment indicated that field work should be performed during the second step of the SI to further evaluate the magnitude and extent of contamination identified at Sites 1, 3E, 5, 6, and 8. Sites 2, 3W, 4, and 7 were also included in the additional work in response to comments provided by FDER on the SITM³ (see Appendix A). Major field tasks in the second step included installation of additional temporary well points and permanent monitor wells; soil, groundwater, and drainageway sampling; aquifer testing; and abandonment of all well points used during the SI. The sampling locations (shown in Attachment 1) and parameters analyzed in the second step of the SI were based on the results of the first step.

2.2.1 Temporary Well Point Installation

In response to comments from FDER on the results of the first step of the SI, five 2-inch diameter well points were installed to complete the initial contamination assessment at Sites 2, 3W, and 7 (see well points 3W-5A, 7-2A, 7-5A, 2-12, and 2-13 on Attachment 1). As in the first step, a decontaminated hand auger was used for the installation.

Lead concentrations exceeded standards in three well points at Site 2 in the first step of the SI but were believed to be a result of total lead concentrations associated with suspended solids present in the groundwater samples. Well points WP 2-12 and 2-13 were installed on the east and west sides of the aircraft parking apron so that field-filtered and unfiltered groundwater samples could be obtained for lead analysis, as requested by FDER.

As described in Section 2.1.3, WP 3W-5, 7-2, and 7-5 were flooded with surface runoff before groundwater samples could be obtained in the first step of the SI. At the request of FDER, well points WP 3W-5A, 7-2A, and 7-5A were installed within 2 feet of the flooded locations during the second step to allow collection of groundwater samples for volatiles, semivolatiles, and lead analyses.

GNV405D/039.51 2-6

Additional well points were installed at Site 6 to evaluate the extent of chromium contamination detected in the groundwater samples from the monitor wells installed at the site for the second step of the SI. Well points WP 6-4, 6-5, and 6-6 were installed downgradient of the two monitor wells in accordance with procedures used previously for the SI.

One additional well point was installed at Site 7 to evaluate whether groundwater at Site 7 was contributing to the chromium detected in the drainageway near this site. Well point WP 7-8 was installed approximately 2 feet northwest of where WP 7-7 was located in accordance with procedures used previously for the SI. Both a filtered and unfiltered sample were collected from WP 7-8 and analyzed for chromium.

2.2.2 Well Point Sampling

When the five new well points at Sites 2, 3W, and 7 were purged dry on November 30, 1989, the water was very turbid and silty, similar to the conditions found in the well points during the first step of the SI. Samples from all five well points were obtained on December 1, 1989, and filtered and unfiltered samples for lead analysis were obtained from WP 2-12 and 2-13 on December 4, 1989. The unfiltered samples were collected first with a decontaminated teflon bailer, then a peristaltic pump and an inline 0.45-micron synthetic fiber filter were used to collect the filtered sample, per FDER QAS Guidance 89-05, Field Filtration Apparatus (revised on September 19, 1989).

The chromium detected in Site 6 groundwater was suspected of being related to suspended sediments in the samples. To evaluate this possibility, the three additional well points installed at the site were purged with a decontaminated teflon bailer and then sampled using a peristaltic pump to collect unfiltered and filtered samples for total chromium analysis. Sampling was conducted on November 5, 1990, in accordance with FDER QAS Guidance 89-05, Field Filtration Apparatus (revised on September 19, 1989).

2.2.3 Well Point Abandonment

After groundwater samples were obtained from the new well points, all of the well points that had been installed as part of the SI were removed. The PVC well points were pulled out of the ground and disposed of and the SST well points were removed and retained for future use. The holes were filled with soil cuttings removed during well point installation. The uppermost 1 to 2 feet of the holes were filled with commercial bentonite clay pellets and hydrated to provide a seal to prevent surface water infiltration into the disturbed soil.

2.2.4 Monitor Well Installation

The original scope of work for the SI had included 27 monitor wells to be distributed among the eight sites at FANG. However, because the results of the first step of the SI indicated less extensive contamination than had been anticipated, only 11 monitor wells were constructed: two at Site 1, two at Site 3E, two at Site 5, two at Site 6, and three at Site 8 (as shown in Attachment 1).

The wells were drilled with hollow-stem augers to a depth of 15 feet bls and were constructed inside the augers using 2-inch diameter PVC casing and 0.010-inch slot screen. As shown in Figure 2-2, the PVC casing in each well extends from land surface to 5 feet bls and the screened interval is from 5 to 15 feet bls. The extent of the screened interval was selected to allow for floating hydrocarbon measurements and provide samples representative of groundwater in the surficial aquifer. Monitor wells were installed in accordance with procedures in the Site Investigation Sampling and Analysis Plan.² At present, there are no plans for monitor well abandonment.

The soil cuttings from the hollow-stem augers were logged as the drilling proceeded. Soil boring logs for the wells are provided in Appendix B. The soils encountered during the monitor well drilling were consistent with conditions noted during well point installation for the first step of the SI. The soil cuttings from the boreholes were spread on the ground in the vicinity of the monitor wells as directed by FANG personnel.

2.2.5 Monitor Well Sampling

On December 1, 4, and 5, 1989, groundwater samples were obtained from the 11 monitor wells installed as part of the second step of the SI and from 3 wells installed by others as part of an underground storage tank (UST) investigation in the Vehicle Maintenance Compound near Site 5. The three wells installed by others were reportedly completed to 10 feet bls and screened from 3 to 10 feet bls. The screened interval is similar enough to that of the SI monitor wells that groundwater samples will be representative of the same zone.

On November 5, 1990, a second set of groundwater samples was obtained from the two monitor wells at Site 6 for total chromium analysis. Both filtered and unfiltered samples were collected with a peristaltic pump, per FDER QAS Guidance 89-05, Field Filtration Apparatus (revised on September 19, 1989).

Before samples were taken, water elevations in the monitor wells were measured with a decontaminated electronic oil/water interface probe. No floating hydrocarbons were detected in any of the wells. The well casing volumes were calculated, and a decontaminated teflon bailer was used to purge the wells of at least four casing volumes. pH, temperature, and conductivity were monitored during purging, which continued until consecutive measurements were within 15 percent of each other.

2.2.6 Soil Sampling

Organic Vapor Analyses

OVA readings above 500 ppm were noted in 15 of the 54 soil samples collected from hand-augered borings during the first step of the SI. To investigate the possibility that sources other than petroleum hydrocarbons were responsible for the high readings, OVA readings were taken in the second step with an instrument equipped with a carbon filter to differentiate between methane and other organic vapors. Samples were collected at three well points (WP 1-2, 2-7, and 4-2) considered representative of those with the high readings. Each sample was taken with a decontaminated SST hand auger and split into two portions. One portion

was analyzed with a carbon filter on the OVA to detect methane and the other without the filter to detect total volatile organic vapors. The results, discussed in Section 5.2.1, indicated methane as the dominant organic vapor in the soil.

Laboratory Analyses

To obtain representative background analyses for comparison with soil samples collected throughout the SI, a soil sample was obtained from a location isolated from the eight sites and not associated with known activities at FANG (see Attachment 1 for location). The sample was obtained with a decontaminated SST hand auger according to the procedure used in the first step of the SI and described in the Site Investigation Sampling and Analysis Plan². The sample was sent to the laboratory for analysis for volatiles, semivolatiles, and priority pollutant metals.

The results of soil sampling during the first step of the SI indicated higher concentrations of barium, chromium, and lead at Site 8 than at the other sites.

Additional soil samples were taken at Site 8 during the second step of the SI for analysis for these constituents. The samples were obtained during standard penetration tests (SPTs) conducted in the boreholes for monitor wells (MW) 8-1, 8-2, and 8-3. Sampling depths were above the water table (1 to 3 feet bls) and just at the water table (3 to 5 feet bls) to assess the potential for soil contamination that could act as a source of groundwater contamination. A sample was also collected from a soil boring (SB 8-5) that was drilled for standard penetration testing (see Attachment 1 for location). The soil samples were collected with SST sampling spoons from the center of a decontaminated 2-foot SPT split-barrel sampler (split-spoon) that had been driven through the soil at the appropriate depths. The SPTs were conducted according to ASTM Standard D1586, and the results are included on the boring logs in Appendix B.

2.2.7 Drainageway Sampling

Sediment samples were collected on November 28, 1989, at the locations shown in Attachment 1. To provide representative background concentrations of chemical parameters for comparison to results from the other samples taken during the SI,

a sediment sample was collected from a location on the FANG drainageway system isolated from and upstream of the eight sites and not associated with known activities at FANG. Surface water samples were collected at two points downstream of the locations sampled during the first step of the SI: DG-1 at the confluence of Reaches 1 and 2 and DG-2 at a point approximately 1,000 feet downstream of DG-1 and immediately upstream of a drainage inflow structure originating at Jacksonville International Airport (see Attachment 1 for locations). Surface water samples were collected from these two locations on December 1, 1989.

2.2.8 Aquifer Testing

On January 3, 1990, slug tests were performed on monitor wells MW 1-1, 3E-2, 5-2, 6-1, and 8-1. All equipment was decontaminated before and between usage at each well. The results of the slug tests are discussed in Section 3.3.

The slug tests were conducted by inducing an instantaneous change in the water level in the well and monitoring the associated water level response with an electronic data recording system. After the initial (static) water level was measured with a steel tape, a pressure transducer was placed below the water level in the well and connected by an electronic transmission cable to a data logger. The slug (a PVC cylinder weighted with gravel) was then inserted into the well (slug-in portion) to induce an essentially instantaneous rise in the water level. After the rate at which the water returned to its static level was recorded by the data logger, the slug was quickly removed from the well (slug-out portion) to induce a corresponding instantaneous drop in the water level. The subsequent rise to the original static water level was also recorded by the data logger.

In well MW 8-1, the slug-in portion of this test could not be conducted properly because the water overflowed the top of the casing in the well as the slug was inserted. The same problem was encountered in the other monitor wells at Site 8. As a result, the procedure for the test was altered at this site as follows: (1) the water was allowed to overtop the well casing on insertion of the slug, (2) the water was removed from the well vault, (3) the water in the well was allowed to return

to its static level, and (4) the slug was removed and the water level response recorded.

2.3 INVESTIGATION-DERIVED WASTE MANAGEMENT

Procedures described in the Site Investigation Sampling and Analysis Plan² for handling investigation-derived waste assumed much higher contaminant concentrations in soil and groundwater than were detected at any of the sites during the first step of the SI. As a result, the original waste management procedures were considered inappropriate for the second step of the SI, and an alternate procedure was followed in which soil cuttings from monitor well installation were spread on the ground at locations on FANG designated by the Deputy Base Civil Engineer. In addition, water extracted from each monitor well during development and purging was discharged on the ground near the well.

2.4 DEVIATIONS FROM SITE INVESTIGATION SAMPLING AND ANALYSIS PLAN

The original procedure proposed for installing temporary well points in the concrete aircraft parking apron at Site 2 during the first step of the SI was to drive them into the soil. After field work revealed that site soils were very cohesive and fine grained, however, it was determined that hand-augered borings would be more appropriate for these well points. Soil cuttings were collected and removed from the apron.

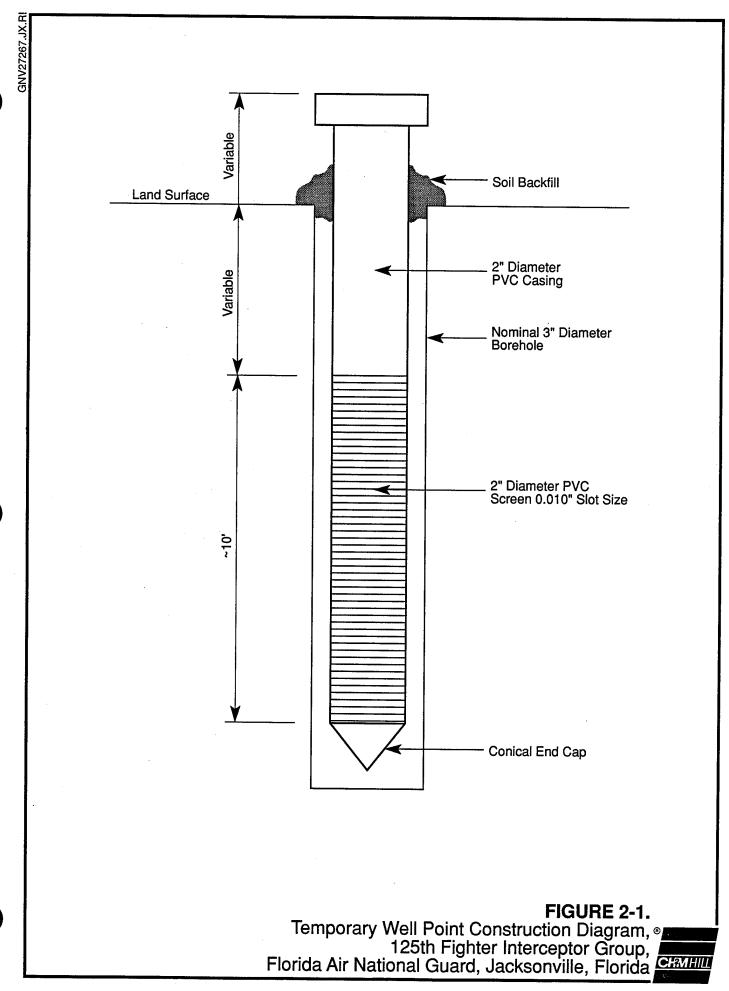
During the first step of the SI, two sediment samples not proposed in the Site Investigation Sampling and Analysis Plan,² 1 C.O. and 1 M.O., were collected in an overflow drainage feature leading from the westernmost OWS inlet at Site 1 to Reach 3. The drainage feature was dry at the time. The samples were collected for laboratory analyses to assess the potential for contaminant transport from the OWS inlet area to Reach 3.

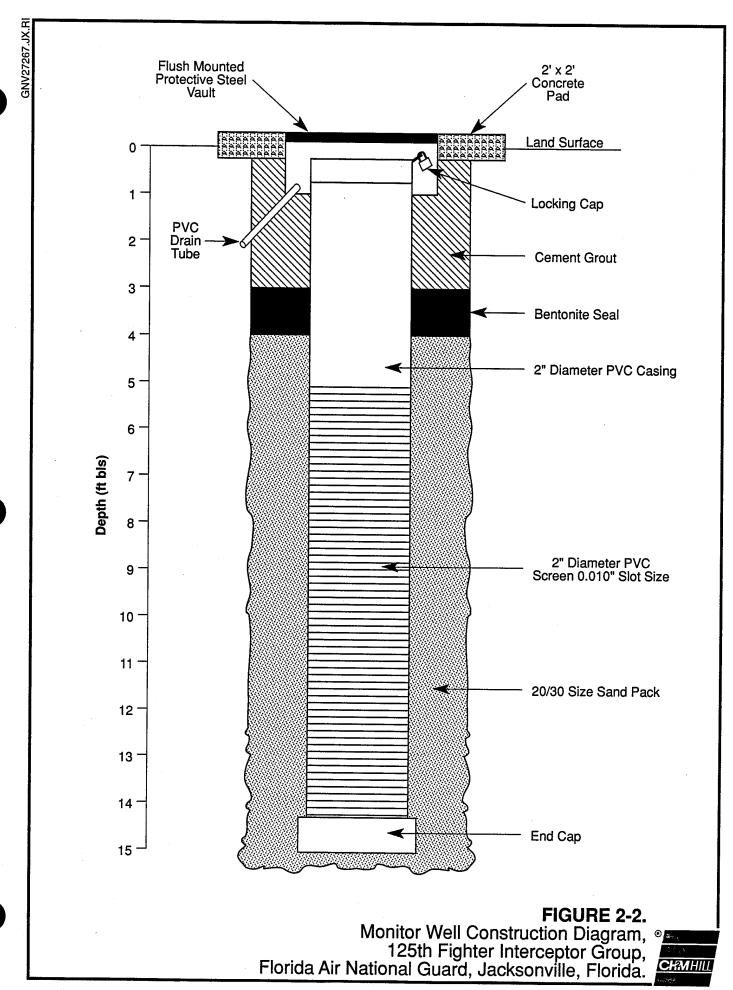
As described in Section 2.3, an alternate procedure was developed for handling investigation-derived waste during the second step of the SI. Other deviations from the Site Investigation Sampling and Analysis Plan² included the methane

differentiation OVA screening performed on three soil samples (described in Section 2.2.6) and the installation and sampling (including field-filtered samples) of several additional well points at the request of FDER, as described in Sections 2.2.1 and 2.2.2. FDER requested the additional well points to complete initial screening activities at sites where surface water flooding had inhibited or prevented sampling during the first step of the SI. Collection and analysis of field-filtered samples was requested as a means for differentiating results for total and dissolved lead.

Table 2-1 SUMMARY OF FIELD ACTIVITIES AND SAMPLES COLLECTED FOR THE SITE INVESTIGATION

			Step 1	p 1						Step 2			
Site	Well Points	OVA Soil	Lab Soil	Ground- water	Surface Water	Sediment	Well Points	Monitor Wells	OVA Soil	Lab Soil	Ground- water	Surface Water	Sediment
1	7	9	11	20	•	9	0	2	1	0	4	,	•
7	12	16	0	œ	•		2	0	-	0	9	•	•
3E	6	7	10	53	•		0	7	0	0	4	•	•
3W	٧٠	'n	4	12	•	•	1	0	0	0	7	•	
4	ю	8	12	12	ю	8	• •	0		0	0	•	•
'n	ю	8	6	5	•	,	0	7	0	0	8	•	•
9	ю	3	4	9			9	7	0	0	13	•	•
7	7	7	4	15	•	,	က	0	0	0	s	•	•
∞	4	4	6	15		•	0	ဧ	0	6	4	•	1
Reach 1	•	0	0	•	3	6	,			ı		0	0
Reach 2	,	0	0	•	ъ	6	•	•	•	ı	,	0	0
Reach 3	ı	0	0	ľ	69	6	ı	,		•	•	•	0
Reach 4	ı	0	0	,	9	14	•	•	•	,	•	0	0
Downstream Location 1	ı	0	0	,	0	0		•	•	1	•		-
Downstream Location 2	•	•	4	1	0	0	•				•		1





SECTION 3 Hydrogeologic Assessment

3. HYDROGEOLOGIC ASSESSMENT

3.1 LOCAL LITHOLOGY

The following discussion on the geologic profile of Duval County is summarized from Florida Geological Survey Report of Investigations No. 43 (Leve, 1966)⁵:

In descending order, the geologic profile includes the Pleistocene and Recent sedimentary deposits, Upper Miocene to Pliocene sediments, the Hawthorn Formation, the Ocala Group Limestones, the Avon Park Limestone, the Lake City Limestone, and the Oldsmar Limestone. The Pleistocene and Recent sediments consist of fine to medium poorly sorted sand and clayey sand with yellow or orange iron staining and range from 20 to 150 feet thick. The Upper Miocene and Pliocene deposits, which range in thickness from 20 to 100 feet, consist of interbedded gray-green calcareous silty clay and clayey sand, fine to medium sand, and cream to brown soft friable limestone. A phosphatic sand and gravel bed marks the contact between these deposits and the Hawthorn Formation, which has a similar lithology but includes significant quantities of phosphate. The Hawthorn Formation ranges in thickness in Duval County from 250 to 500 feet.

The principal aquifer system in the area is the Floridan, which is found within the Ocala Group, Avon Park, Lake City, and Oldsmar limestones. The Hawthorn Formation acts as an upper confining unit for the Floridan aquifer, restricting flow between it and the surficial aquifer.

Leve⁵ reports that the shallow aquifers overlying the Floridan limestone aquifer consist of sand and shell beds within the Pleistocene and Recent deposits; shell, limestone, and sand beds within the Upper Miocene and Pliocene deposits; and limestone and sand beds within the Hawthorn Formation. Fairchild⁶ states that hardpan layers of iron-oxide cemented quartz sand may be present within the Pleistocene and Recent deposits and that the potentiometric surface of the Floridan aquifer may be higher than the surficial aquifer, providing it with upward

recharge. This opinion is substantiated by the presence of artesian wells in the area.

The cone penetrometer testing performed by In-Situ Technology, Inc., provided additional data on the hydrogeology in the western portion of FANG. The results of the piezocone penetration (provided in Appendix C) indicate that the geologic profile consists mainly of weakly consolidated to unconsolidated, fine grained sediments to a depth of 90 feet. The sedimentary material ranges from fine sand to soft clay and muck. The test was terminated at 90 feet bls, where a dense layer prevented further penetration of the piezocone. A generalized geologic section based on the piezocone results is shown in Figure 3-1.

The piezocone sounding test in Appendix C appears to indicate clayey strata occurring at about 4 to 6 feet, 24 to 26 feet, and around 60 feet bls. The pore pressure shows a marked increase from about 67 to 77 feet, which may indicate a primary zone of semi-confined groundwater. Pore pressure data also suggest the presence of other semi-confined zones throughout the profile.

Four soil types have been mapped in the FANG area by the Soil Conservation Service⁷ (see Figure 3-2). The Pelham fine sand, a nearly level, poorly drained soil found in broad flatwood areas, is rapidly permeable to a depth of 21 inches and moderately permeable below. The Arents soils, which are nearly level and poorly drained, have been reworked by earthmoving operations and generally consist of mixed native and imported materials. The Yulee clay is a nearly level, very poorly drained soil with moderately slow permeability. Urban land soils consist of areas with 85 percent or higher coverage by buildings, pavement, or other development.

Soil profiles were noted for the boreholes made during well point installation. In general, the soil profile over most of the sites consists of dark gray sand and organic matter overlying dark brown to orange clayey silty sand overlying gray to blue clayey sandy silt. Most of the soils are dense and fine grained, which indicates limited permeability. Rainfall was observed to mainly pond and run off; the lack of percolation also suggests low permeability soils. In many of the soils,

yellow or orange iron-oxide stains indicate an oxidizing environment, and several boreholes contained organic muck, roots, and wood chips.

The boreholes drilled for monitor wells installed as part of the second step of the SI were logged by noting the lithology of the soil cuttings brought to the surface by the hollow-stem augers. Soil boring logs are provided in Appendix B. The soil borings substantiate the data obtained from the hand-augered borings performed in the first step of the SI that indicate two distinct lithologies at FANG.

At Sites 1, 2, 3E, 3W, 4, 7, and 8, the sediments were finer grained with a higher clay and silt content than was exhibited at Sites 5 and 6. Brown or dark gray to blue-gray silty to clayey sand was encountered in the boreholes for the wells at Sites 1, 3E, and 8; these soils demonstrated high plasticity and cohesiveness, as they wound around the auger blade as it was brought to the surface. The sediments at Sites 5 and 6 were generally coarser and less cohesive than those at the other sites and would be expected to be more permeable.

3.2 WATER ELEVATION DATA AND GROUNDWATER FLOW DIRECTIONS

3.2.1. First Step of the Site Investigation

Table 3-1 lists groundwater elevations measured on June 2, 1989, in all the well points except those for Site 2, which had not yet been installed. Water levels measured in the three monitor wells installed by others near Site 5 are also included. The data reflect conditions after a long dry period (none of the rain events experienced during the field work had yet occurred), and the measurements were made before any water was evacuated from any of the well points. The dry conditions are also reflected in the surface water elevation data in Table 3-2, which were obtained when the drainageway reach sampling locations were surveyed on June 1 and 2, 1989.

Groundwater elevations in the same well points shown in Table 3-1 were measured again on June 23, 1989, after several rainfall events, and the data are reported in Table 3-3. The elevations were generally higher by about 1 foot at most of the sites, but showed little change at Sites 3E and 3W. Table 3-3 also lists

elevation data for measurements made on June 23 at several well points at Site 2, as well as groundwater elevations measured on June 13, 1989, in WP 2-1 through 2-5 on the aircraft parking apron. These well points were removed on June 14, 1989.

Figure 3-3 shows groundwater contours based on well point data collected in June 1989. The data indicate a general flow of groundwater from west to east. While some local effects are shown in Figure 3-3, groundwater flow directions on a local (individual site) scale may vary. Groundwater flow at individual sites is addressed below.

Figure 3-4 shows the elevations of groundwater in well points at Sites 1 and 2 and of surface water at the sampling locations in nearby Reach 3. At Site 1, shallow groundwater appears to be flowing in a northeasterly direction toward the drainageway. At Site 2, the groundwater elevations are higher beneath the aircraft parking apron than in the well points adjacent to the apron, so groundwater appears to be flowing from the apron in all directions.

The shallow groundwater elevations in the well points at Site 3E and the surface water elevations at sampling points R2D, R1C, and R1D are shown in Figure 3-5. Groundwater flow at this site is variable and may be affected by topography, surface drainage patterns, and the two drainageway reaches that border the site to the northeast and south. Shallow groundwater flow appears to be toward Reach 2 in the northern part of Site 3E and toward Reach 1 in the southern part of the site. The groundwater elevation in WP 3E-2 is anomalously low and the elevation at R1C appears to be high. The irregularities in water levels may be attributable to the presence or absence of lenses of groundwater that are perched on top of clayey soils.

Figure 3-6 shows the shallow groundwater elevations in well points at Sites 3W and 7 and surface water elevations at sampling point R2C in Reach 2. The shallow groundwater flow at Site 3W appears to follow the surface drainage patterns determined by topography. In general, groundwater flows from the higher area near WP 3W-1 toward the lower area near WP 3W-4. At Site 7, the general direction of shallow groundwater flow appears to be toward Reach 2. In

the immediate vicinity of the trim pad, however, the groundwater flow pattern is unclear and is probably affected by local recharge conditions around the trim pad, differences in evaporation rates, soil compaction from construction, and local topography.

Site 4 shallow groundwater elevations and surface water elevations at R3D and R2U are shown in Figure 3-7. The data indicate a northeast-to-southwest groundwater flow direction, from the Hush House toward a nearby swampy wooded area. Surface soils in this wooded area were essentially dry at the beginning of field activities but would be expected to be saturated by a rise in shallow groundwater during wet seasons. Pools of standing water were observed in this area after several rainfall events during the SI.

Figure 3-8 shows the shallow groundwater elevations in well points at Site 5 and the three monitor wells installed by others in the Vehicle Maintenance Compound. The water table at this site is relatively flat, but movement appears to be toward the drainage ditch to the immediate southwest.

The shallow groundwater elevations at Site 6 are shown in Figure 3-9 and indicate a relatively flat water table. Groundwater appears to flow in a northwesterly direction, following the general land surface topography.

Figure 3-10 shows the shallow groundwater elevations in the well points at Site 8 and the surface water elevations in Reach 4. The direction of groundwater flow appears to be north from the OWS toward the drainageway.

3.2.2. Second Step of the Site Investigation

Table 3-4 lists the groundwater elevations measured between December 1 and 5, 1989, in the newly installed and existing monitor wells at the eight sites. Table 3-5 lists the groundwater elevations measured at Site 6 on November 5 and 20, 1990. The measurements were made in each well immediately before it was purged for sampling. A comparison of Tables 3-4 and 3-1 indicates that groundwater elevations at FANG were similar in June and December 1989.

Figure 3-11 shows groundwater contours based on monitor well data collected in December 1989. The data indicate a general flow of groundwater from west to east, as was previously observed in June 1989. Groundwater flow at individual sites is discussed below.

The shallow groundwater elevations in the monitor wells at Site 1 are shown in Figure 3-12. The water table is relatively flat and appears to flow in a northerly direction toward Reach 3, as observed in previous well point data.

Figure 3-13 shows the shallow groundwater elevations measured in the monitor wells at Site 3E. As in the first step of the SI, the general direction of groundwater flow in the southern portion of the site appears to be toward Reach 1.

The shallow groundwater elevations at Site 5 are shown in Figure 3-14. The water table is relatively flat, and the direction of groundwater flow appears to be toward the west and southwest.

Figure 3-15 shows the shallow groundwater elevations in the monitor wells at Site 6. The water table is relatively flat. The apparent gradient toward the west is consistent with the gradient observed in the first step of the SI.

Figure 3-16 shows the groundwater elevations in the monitor wells and three additional well points at Site 6 in November 1990. The groundwater flow direction appears to be to the northwest, as observed previously at the site.

The shallow groundwater elevations at Site 8 are presented in Figure 3-17 and indicate that the water table is relatively flat. In the southern portion of the site, groundwater appears to flow in a northeasterly direction toward Reach 4, which is probably a local groundwater divide (i.e., surficial groundwater flow does not cross Reach 4). Groundwater north of Reach 4 (in the vicinity of MW 8-3) is expected to flow to the southeast, toward (and possibly discharging into) the drainageway.

3.2.3 Groundwater-Surface Water Interaction

Surface water elevations were shown in Figures 3-4 through 3-17 to help illustrate the relationships between shallow groundwater and drainageway surface waters, which are important in understanding flow patterns at FANG. The apparent inconsistency of the connection between surface water and groundwater elevations across FANG is a result of several factors. Inputs of water from outside sources (e.g., direct rainfall, upstream inflow, wash water from FANG activities) can raise surface water elevations above groundwater elevations, causing water to flow from the drainageways into the shallow groundwater (as well as downstream in the channels themselves). Conversely, when there is little outside inflow to the drainageways and conditions are dry, groundwater is generally higher than the surface water and flows into the drainageways.

3.3 ESTIMATED AQUIFER CHARACTERISTICS

3.3.1 Cone Penetrometer Testing

During the first step of the SI, a subconsultant, In-Situ Technology, Inc., performed a permeability test of shallow aquifer materials at a depth of 7 feet bls. Detailed test data are presented in Appendix C. The test location is shown in Attachment 1. Based on test interpretations by the subconsultant, the hydraulic conductivity (K) of the material at that location and depth appears to range from about 1.5 to 2.0 x 10⁻⁴ cm/sec (0.43 to 0.57 ft/day). If a K value of about 1.75 x 10⁻⁴ cm/sec (0.5 ft/day) is assumed, along with an estimated range of porosity of 0.2 to 0.4 (based on literature values for comparable media) and a measured range of hydraulic gradients at FANG of 0.001 to 0.05 ft/ft, the average linear horizontal groundwater flow velocity is estimated to range from 0.00125 to 0.125 ft/day in the surficial aquifer in the area of the test.

3.3.2 Slug Testing

Slug tests were performed at one well on each of the five sites where monitor wells were constructed during the second step of the SI. Data from each slug test were analyzed by a method described by Bouwer⁸ to estimate the K of the upper

unconfined aquifer throughout the site. Because the geology of the aquifer material may not be uniform over the site, the actual K value at other locations may differ from the estimate. Tables of calculations for K values are provided in Appendix D, along with the slug test data and semi-log plots of water level versus time.

The representative K for each of the five sites at which slug tests were performed is shown in Table 3-6. The estimates were obtained by rounding the K values calculated using the slug test data to the nearest integer value. Hydraulic conductivity appears to be lower on the eastern side of FANG (Sites 1 and 3E) and higher on the western side (Sites 5, 6 and 8); the highest K value was estimated for Site 6, which is the westernmost site at FANG. The data are consistent with the observations of subsurface conditions encountered during handauger borings and monitor well drilling across FANG.

The K estimates from slug test results include the entire screened interval of the aquifer (5 to 15 feet bls). They are not, therefore, directly comparable to the K value of approximately 0.5 ft/day estimated by the piezocone testing, which was performed in the vicinity of MW 1-1 at a depth of 7 feet bls. The slug test data provide an average K over a greater interval than the data from the piezocone test; this average is probably more representative of the bulk flow of groundwater through the surficial aquifer.

Table 3-1 GROUNDWATER ELEVATION DATA FROM JUNE 2, 1989 (FIRST STEP OF THE SI) 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Location	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
	Zievation (it)	water (It)	Elevation (10)
WP 1-1	26.08	4.59	21.49
WP 1-2	27.00	6.67	20.33
WP 1-3	27.66	6.19	21.47
WP 1-4	27.00	5.89	21.11
WP 1-5	25.83	4.69	21.14
WP 1-6	25.69	4.94	20.75
WP 3E-1	22.37	5.03	17.34
WP 3E-2	23.34	6.65	16.69
WP 3E-3	24.29	7.00	17.29
WP 3E-4	21.44	4.27	17.17
WP 3E-5	23.24	5.55	17.69
WP 3E-6	25.29	5.48	19.81
WP 3E-7	24.31	5. 9 8	18.33
WP 3E-8	24.51	5.43	19.08
WP 3E-9	25.76	7.64	18.12
WP 3W-1	22.95	4.81	18.14
WP 3W-2	22.72	5.33	17.39
WP 3W-3	21.31	3.92	17.39
WP 3W-4	21.78	5.71	16.07
WP 3W-5	22.26	4.91	17.35
WP 4-1	27.81	5.21	22.60
WP 4-2	22.85	3.47	22.38
WP 4-3	22.92	4.24	18.68
WP 5-1	25.11	3.14	21.97
WP 5-2	25.32	3.30	22.02
WP 5-3	28.01	5.99	22.02
WP 6-1	30.40	DRY	
WP 6-2	29.29	7.14	22.15
WP 6-3	28.69	6.41	22.28
WP 7-1	25.02	6.17	18.85
WP 7-2	25.31	6.27	19.04
WP 7-3	23.96	5.38	18.58
WP 7-4	25.71	7.17	18.54
WP 7-5	23.47	5.74	17.73
WP 7-6	23.75	5.80	17.95
WP 7-7	23.93	6.14	17.79
WP 8-1	25.29	3.69	21.60
WP 8-2	25.63	4.19	21.44
WP 8-3	26.07	4.51	21.56
WP 8-4	24.08	2.70	21.38
MW-A ^a	27.30	4.96	22.34
MW-B ^a	26.95	4.66	22.29
MW-C ^a	27.69	5.57	22.12

^aMonitor well installed by others.

Table 3-2 SURFACE WATER ELEVATIONS MEASURED AT DRAINAGEWAY SAMPLING LOCATIONS ON JUNE 1 AND 2, 1989 (FIRST STEP OF THE SI) 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Location	Water Surface Elevation (ft)
R1U	Not Measured
R1C	18.9
R1D	18.0
R2U	18.3
R2C	17.3
R2D	16.5
R3U	20.5
R3C	18.9
R3D	18.9
R4U	22.8
R4C	21.7
R4D	21.3

Note:

All water level measurements surveyed by CH2M HILL. See Attachment 1 for

locations.

Table 3-3
GROUNDWATER ELEVATION DATA FROM JUNE 13 AND 23, 1989
(FIRST STEP OF THE SI)
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Location	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Comments
WD 1 1				
WP 1-1	26.08	2.69	23.39	may contain surface water
WP 1-1A	24.51	0.98	23.53	may contain surface water
WP 1-2	27.00	6.43	20.57	
WP 1-3	27.66	4.53	23.13	
WP 1-4	27.00	3.81	23.19	
WP 1-5	25.83	2.50	23.33	
WP 1-6 WP 2-1	25.69 27.10	3.15	22.54	
WP 2-1 WP 2-2	27.10 26.75	4.48	22.62	measured 6/13/89
WP 2-2	26.75 27.10	4.33	22.42	measured 6/13/89
WP 2-4	27.10 27.30	4.37	22.73	measured 6/13/89
WP 2-5	27.20 27.20	4.84 4.70	22.46 22.50	measured 6/13/89
WP 2-6	26.79	4.70	22.30	measured 6/13/89 unable to measure ^a
WP 2-7	26.35			unable to measure ^a
WP 2-8	27.74	8.78	18.96	unable to measure
WP 2-9	27.89	9.07	18.82	
WP 2-10	26.45	8.09	18.36	
WP 2-11	27.20	7.64	19.56	
WP 3E-1	22.37	5.34	17.03	
WP 3E-2	23.34	6.82	16.52	
WP 3E-3	24.29	7.01	17.28	
WP 3E-4	21.44	4.34	17.10	may contain surface water
WP 3E-5	23.24	5.95	17.29	may contain purious water
WP 3E-6	24.14	7.63	16.51	
WP 3E-7	24.31	6.18	18.13	
WP 3E-8	24.51	5.51	19.00	
WP 3E-9	25.76	7.90	17.86	
WP 3W-1	22.95	5.46	17.49	
WP 3W-2	22.72	5.92	16.80	
WP 3W-3	21.31	3.32	17.99	
WP 3W-4	21.78	4.93	16.85	
WP 3W-5	22.26	2.43	19.83	
WP 4-1	27.81	3.46	24.35	
WP 4-2	25.85	2.33	23.52	
WP 4-3	22.92	4.14	18.78	
WP 5-1	25.11	1.52	23.59	may contain surface water
WP 5-2	25.32	1.71	23.61	may contain surface water
WP 5-3	28.01	4.34	23.67	
WP 6-1 WP 6-2	29.00 29.29	15.72	23.29	
WP 6-3	28.69	6.21 5.48	23.08 23.21	
WP 7-1	25.02	3.46 3.96	23.21	
WP 7-2	25.31	5.90 5.01	20.30	
WP 7-3	23.96	2.63	21.33	
WP 7-4	25.71	7.10	18.61	
WP 7-5	23.47	5.04	18.43	,
WP 7-6	23.75	5.34	18.41	
WP 7-7	23.93	5.80	18.13	
WP 8-1	25.29	2.63	22.66	
WP 8-2	25.63	3.52	22.11	
WP 8-3	26.07	3.51	22.56	

Table 3-3 (continued)

Location	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Comments
WP 8-4 MW-A	24.08 27.30	2.01 3.70	22.07 23.60	monitor well installed by
MW-B	26.95	3.38	23.57	others monitor well installed by
MW-C	27.69	4.10	23.59	others monitor well installed by others

^aInterface probe would not pass joint in well screen.

Table 3-4
GROUNDWATER ELEVATION DATA FROM DECEMBER 4 AND 5, 1989
(SECOND STEP OF THE SI)
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Date	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
10/5/90	24.54	4.00	20.45
• •			20.45
12/5/89	22.32	1.89	20.43
12/4/89	24.05	5.50	18.55
12/4/89	23.55	5.32	18.23
12/5/89	26.73	4.22	22.51
12/5/89	26.77	4.22	22.55
12/1/89	27.98	4.83	23.15
12/1/89	25.54	2.70	22.84
12/5/89	23.88	2.05	21.83
12/5/89	24.00	2.29	21.71
12/5/89	24.05	2.48	21.57
12/4/89	27.30	4.72	22.58
12/4/89	26.95	4.31	22.65
12/4/89	27.69	5.08	22.61
	12/5/89 12/5/89 12/4/89 12/4/89 12/5/89 12/5/89 12/1/89 12/5/89 12/5/89 12/5/89 12/5/89 12/4/89	Date Elevation (ft) 12/5/89 24.54 12/5/89 22.32 12/4/89 24.05 12/4/89 23.55 12/5/89 26.73 12/5/89 26.77 12/1/89 27.98 12/1/89 25.54 12/5/89 23.88 12/5/89 24.00 12/5/89 24.05 12/4/89 27.30 12/4/89 26.95	Date Elevation (ft) Water (ft) 12/5/89 24.54 4.09 12/5/89 22.32 1.89 12/4/89 24.05 5.50 12/4/89 23.55 5.32 12/5/89 26.73 4.22 12/5/89 26.77 4.22 12/1/89 27.98 4.83 12/1/89 25.54 2.70 12/5/89 23.88 2.05 12/5/89 24.00 2.29 12/5/89 24.05 2.48 12/4/89 27.30 4.72 12/4/89 26.95 4.31

^aMonitor well installed by others

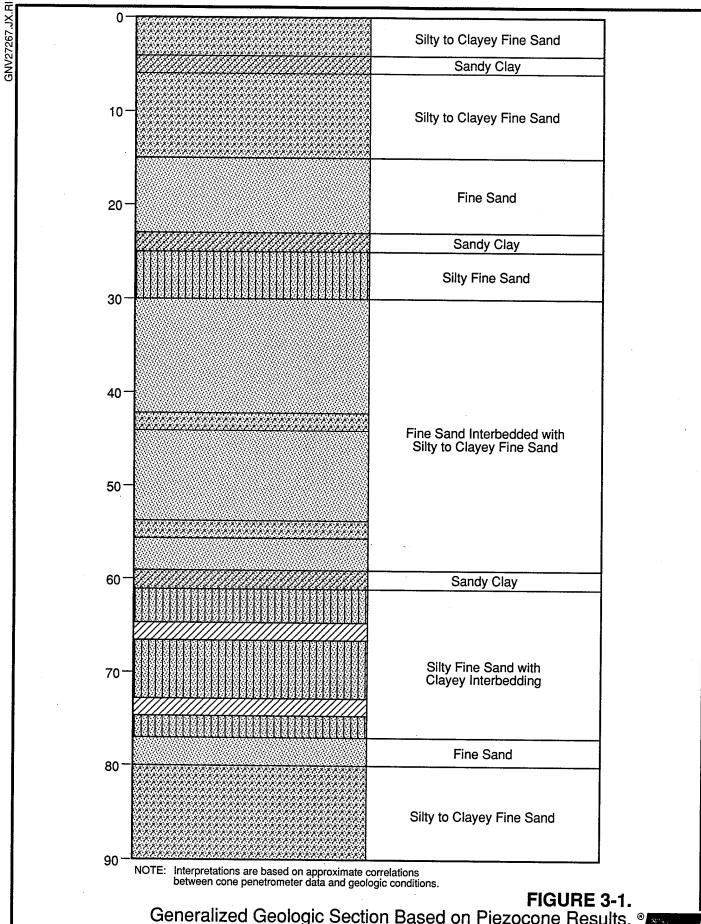
Table 3-5 GROUNDWATER ELEVATION DATA FROM NOVEMBER 5 AND 20, 1990, FOR SITE 6 125TH FIGHTER INTERCEPTOR GROUP FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Location	Date	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
MW	11/05/00	•= ••		
MW 6-1	11/05/90	27.98	5.30	22.68
MW 6-2	11/05/90	25.54	3.13	22.41
WP 6-4	11/05/90	30.02	8.05	21.97
WP 6-5	11/05/90	25.23	3.73	21.50
WP 6-6	11/05/90	28.60	7.76	20.84
MW 6-1	11/20/90	27.98	5.61	22.37
MW 6-2	11/20/90	25.54	3.45	22.09
WP 6-4	11/20/90	30.02	8.31	21.71
WP 6-5	11/20/90	25.23	3.98	21.25
WP 6-6	11/20/90	28.60	7.98	20.62

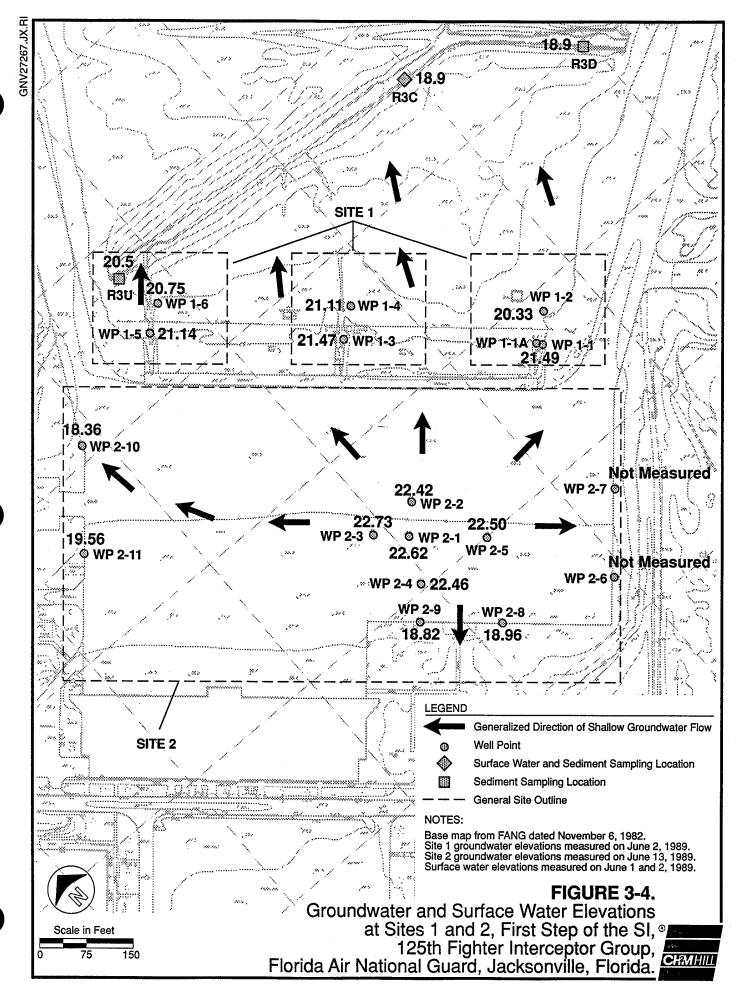
3-14

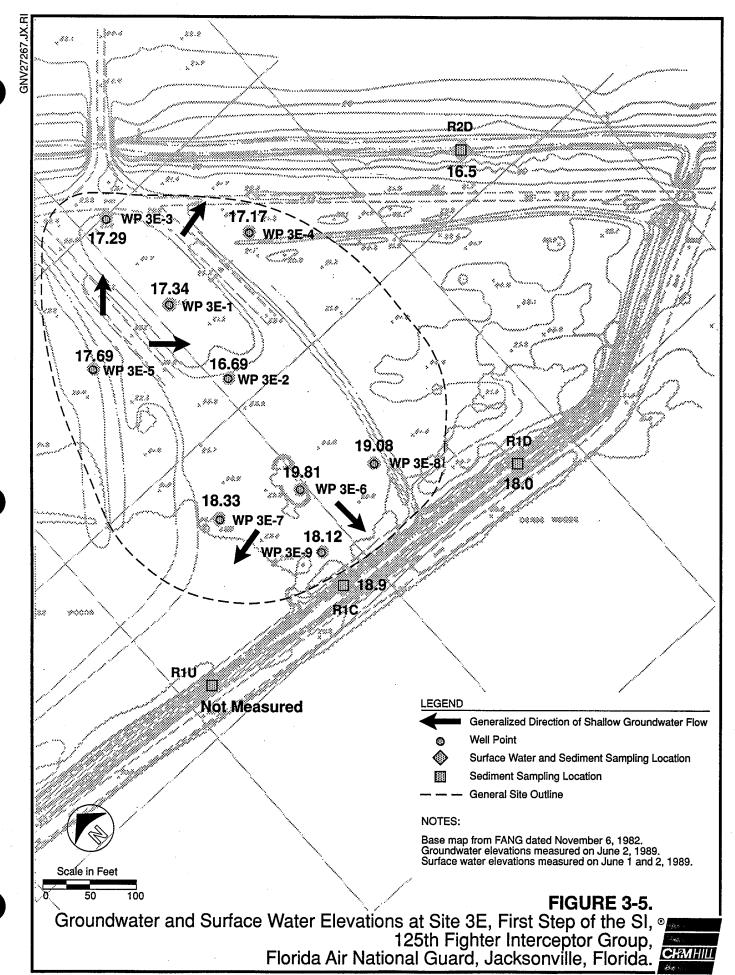
Table 3-6
SLUG TEST ESTIMATES OF AQUIFER HYDRAULIC CONDUCTIVITY
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD,
JACKSONVILLE, FLORIDA

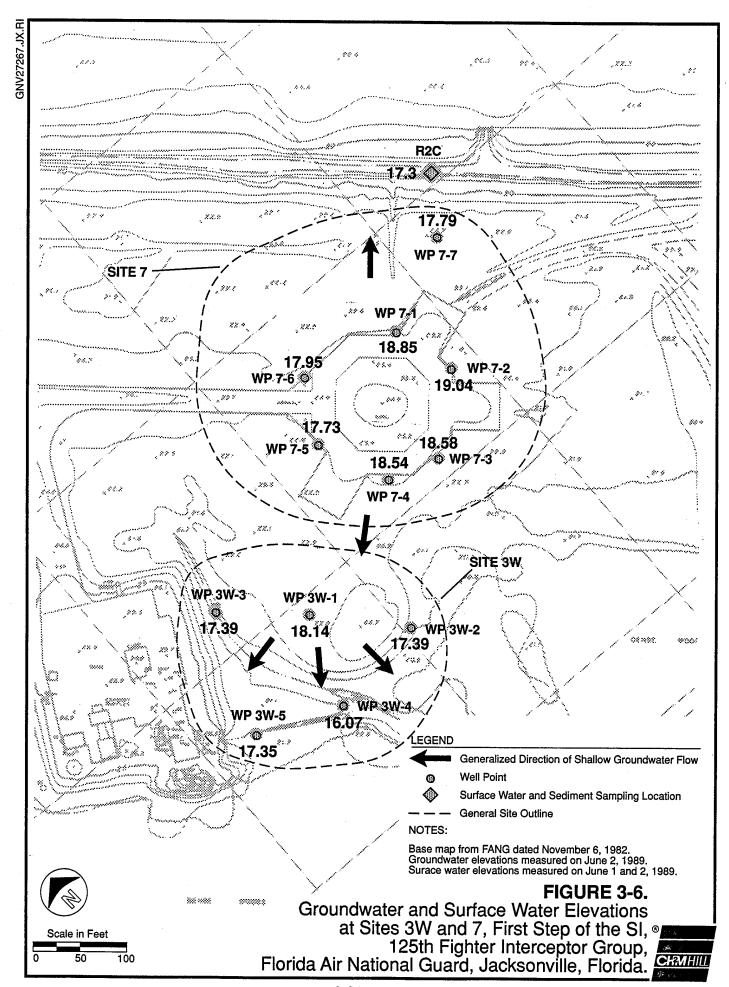
Site	Monitor Well	K (ft/day)
1	MW 1-1	1
3E	MW 3E-2	1
5	MW 5-2	2
6	MW 6-1	5
8	MW 8-1	2

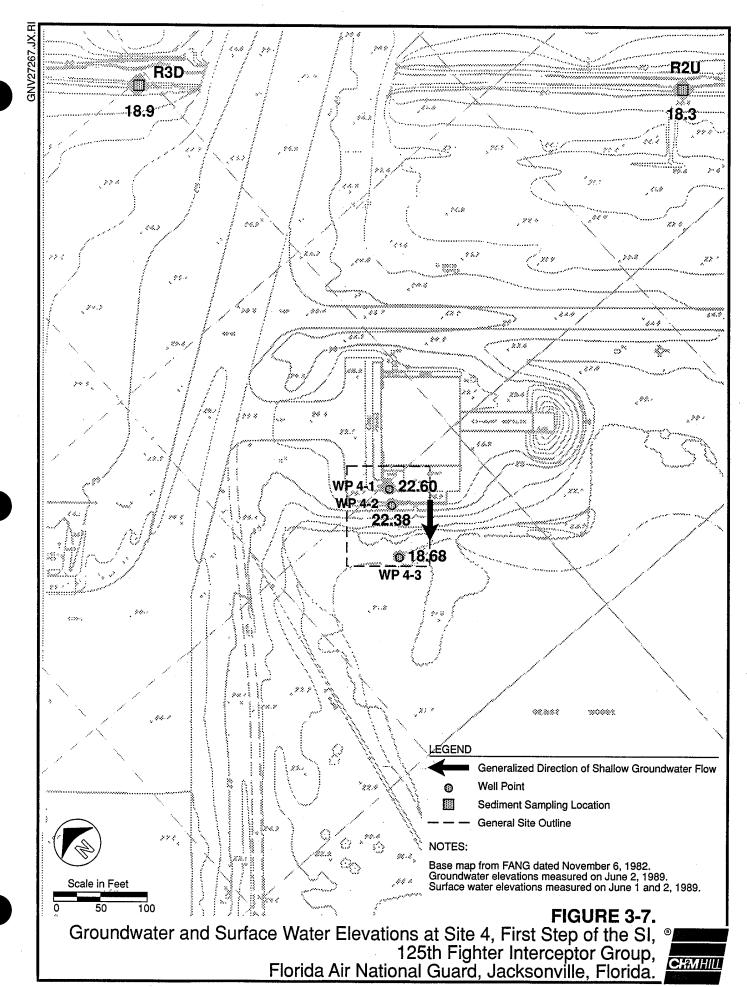


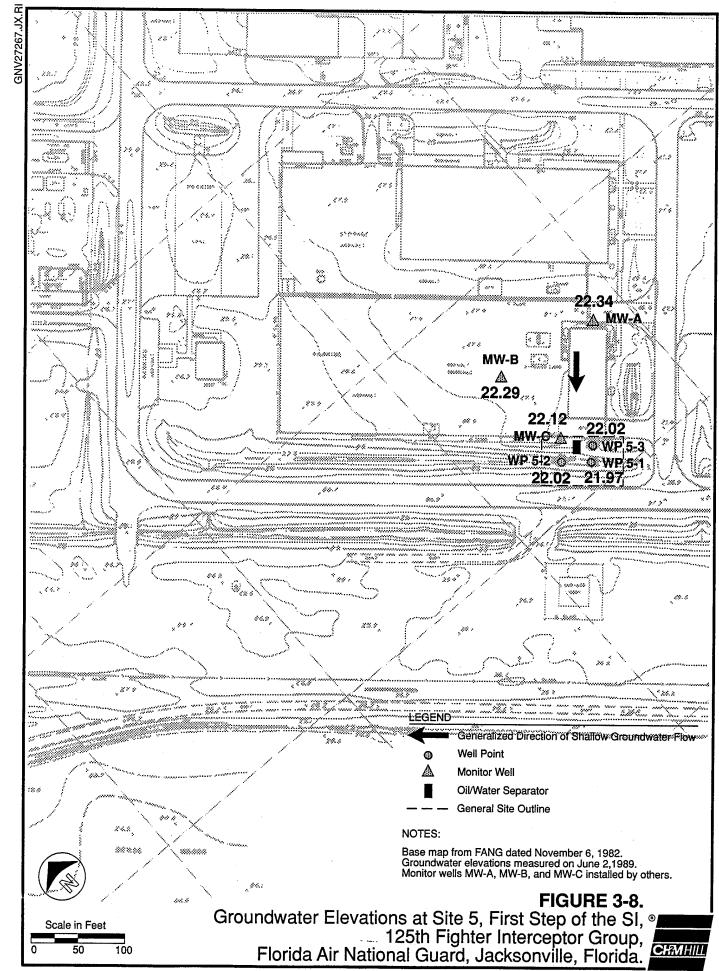
Generalized Geologic Section Based on Piezocone Results, © 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Florida.

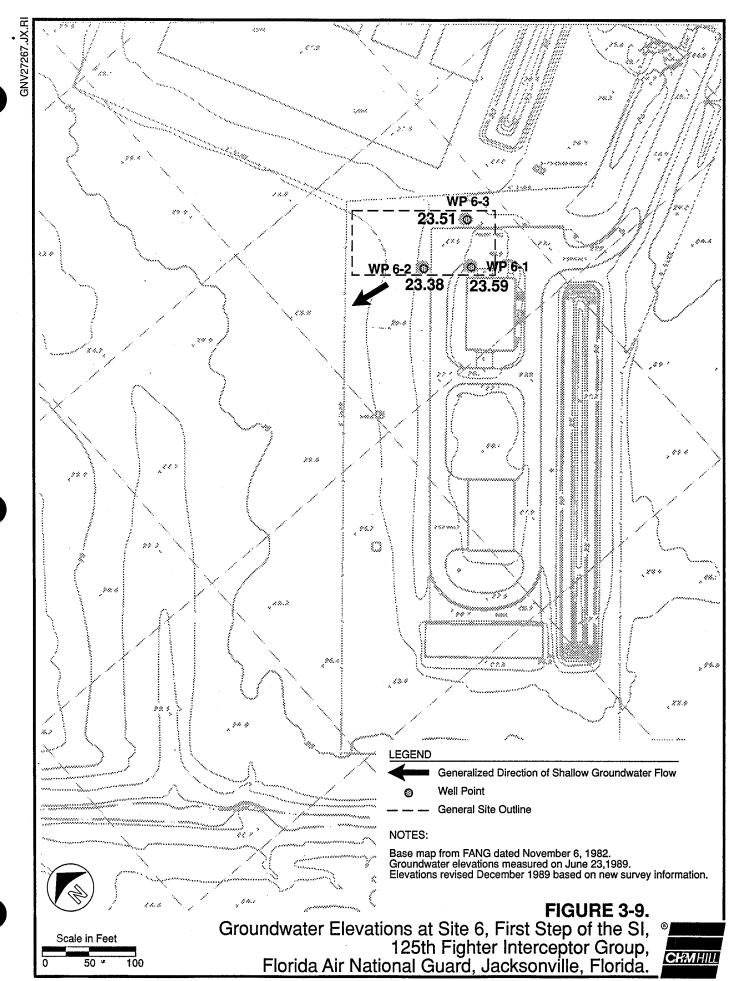


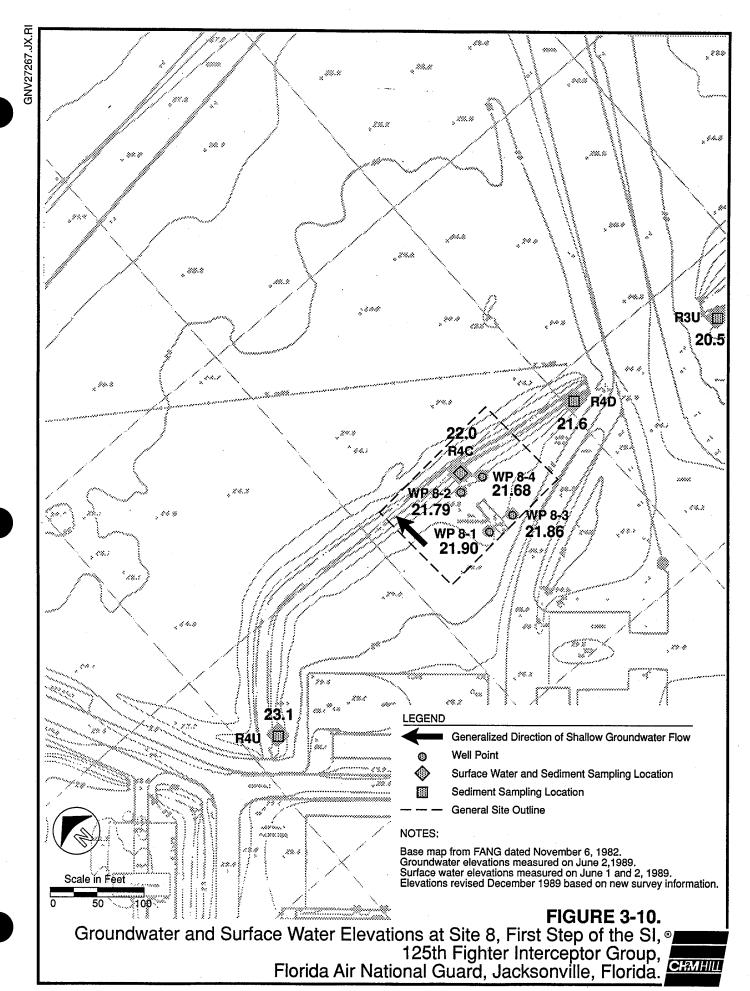


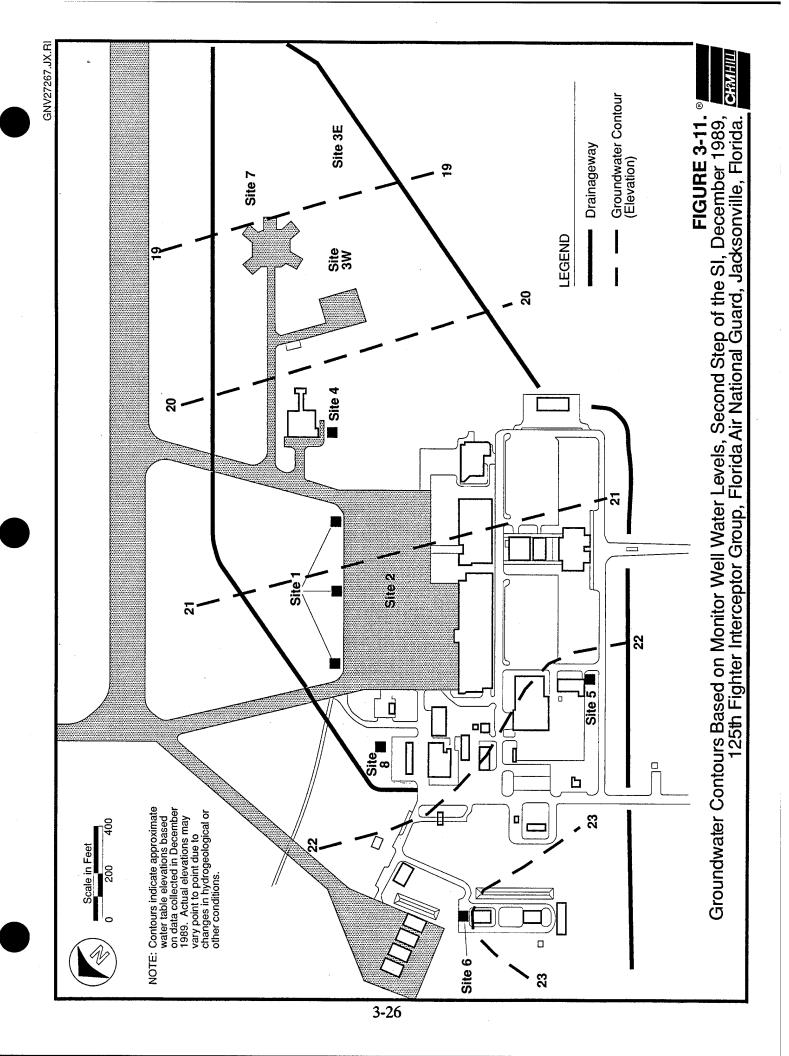


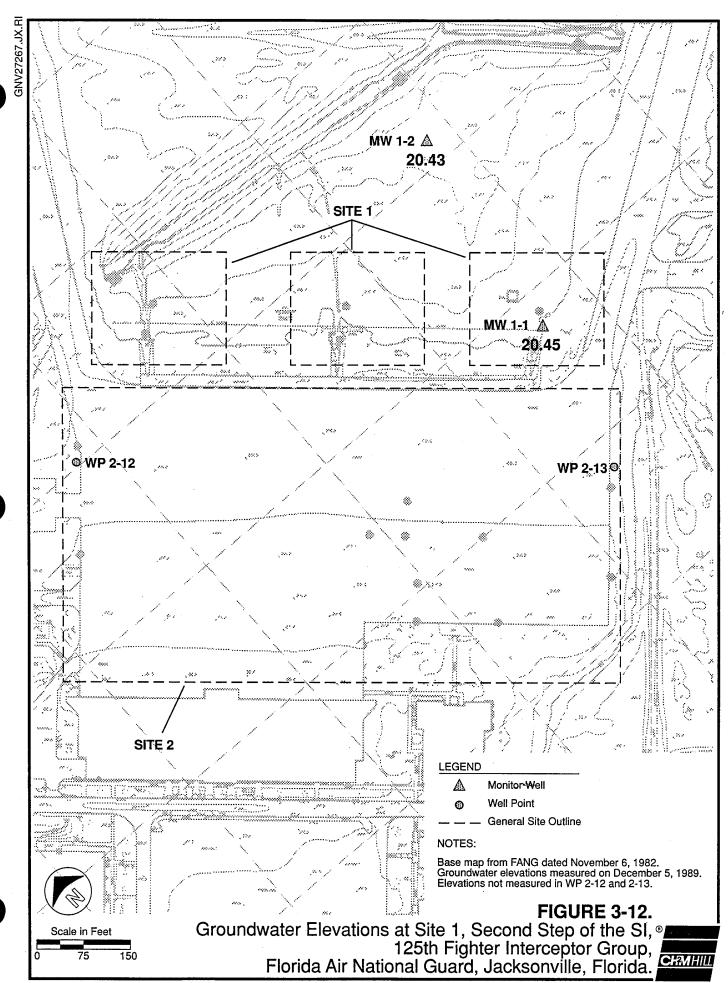


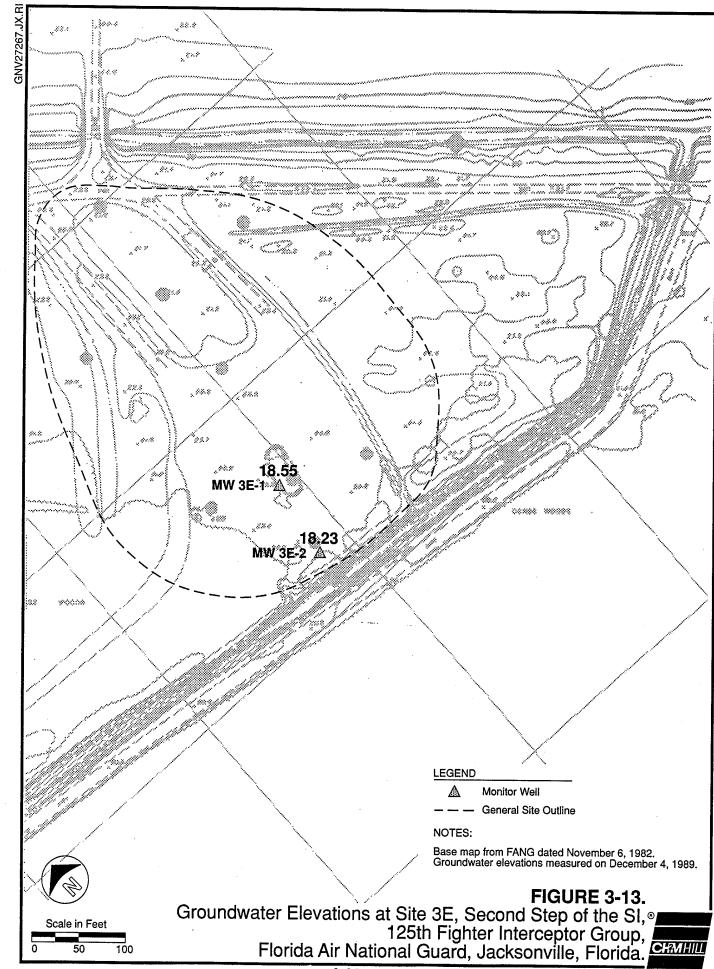


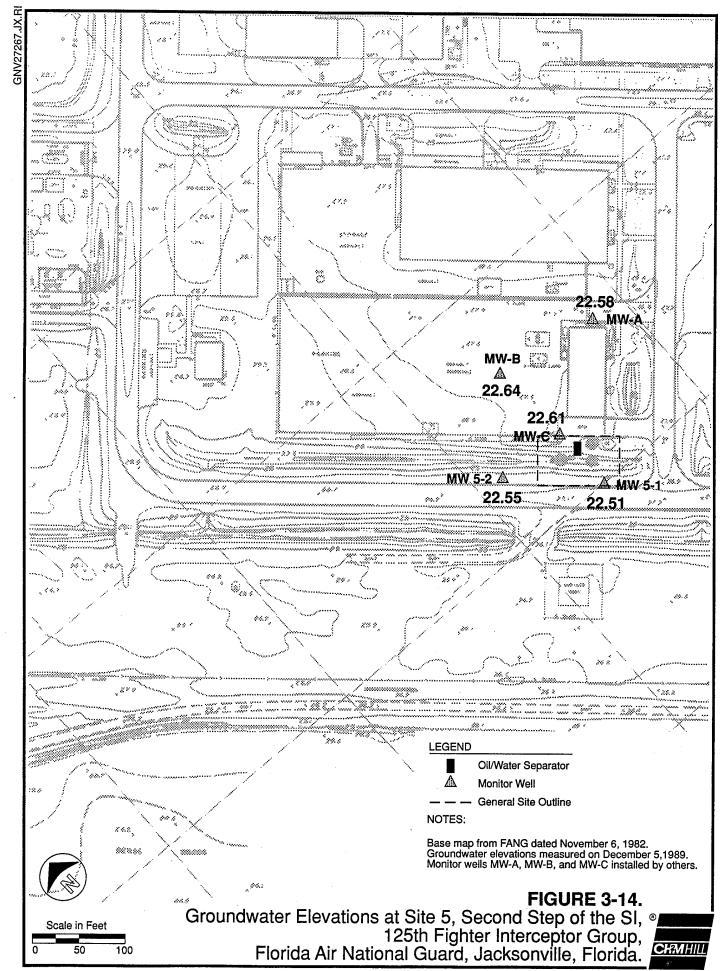


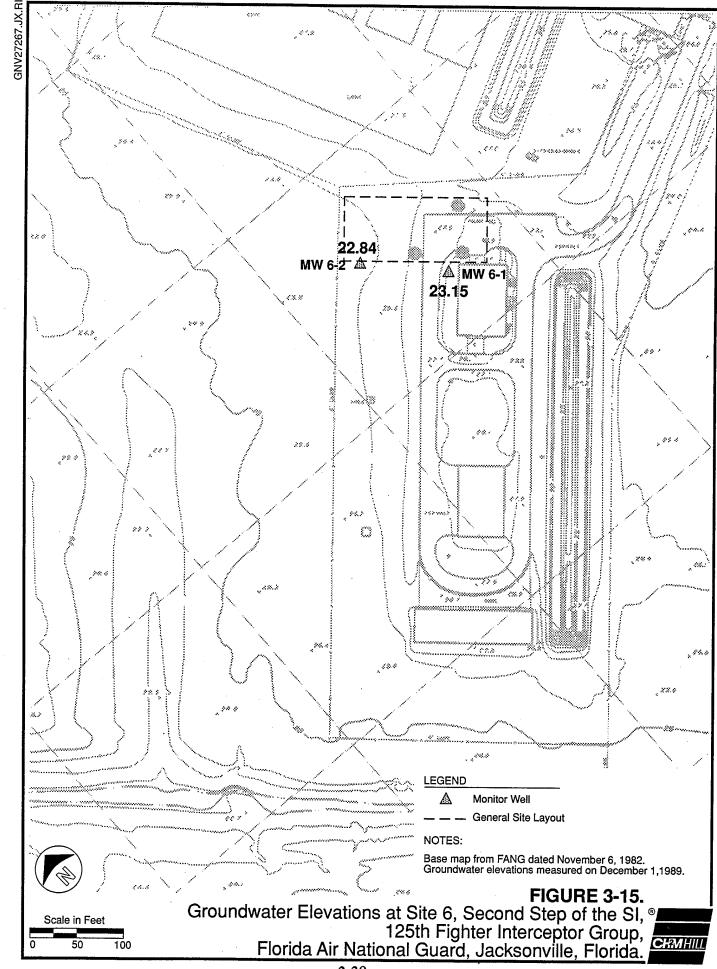


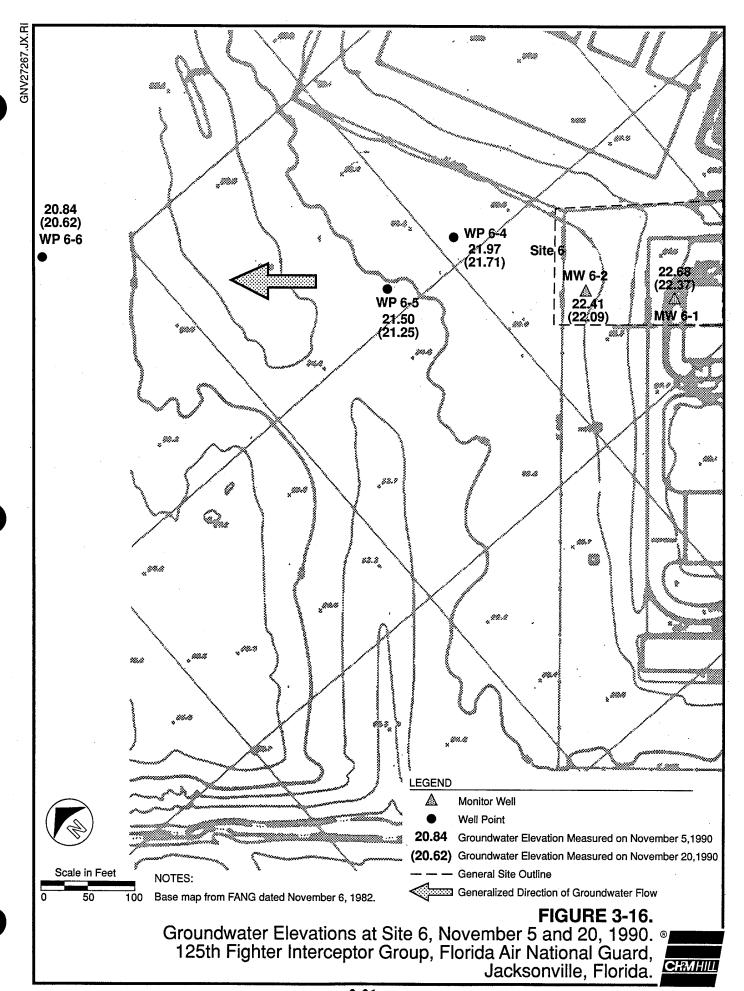


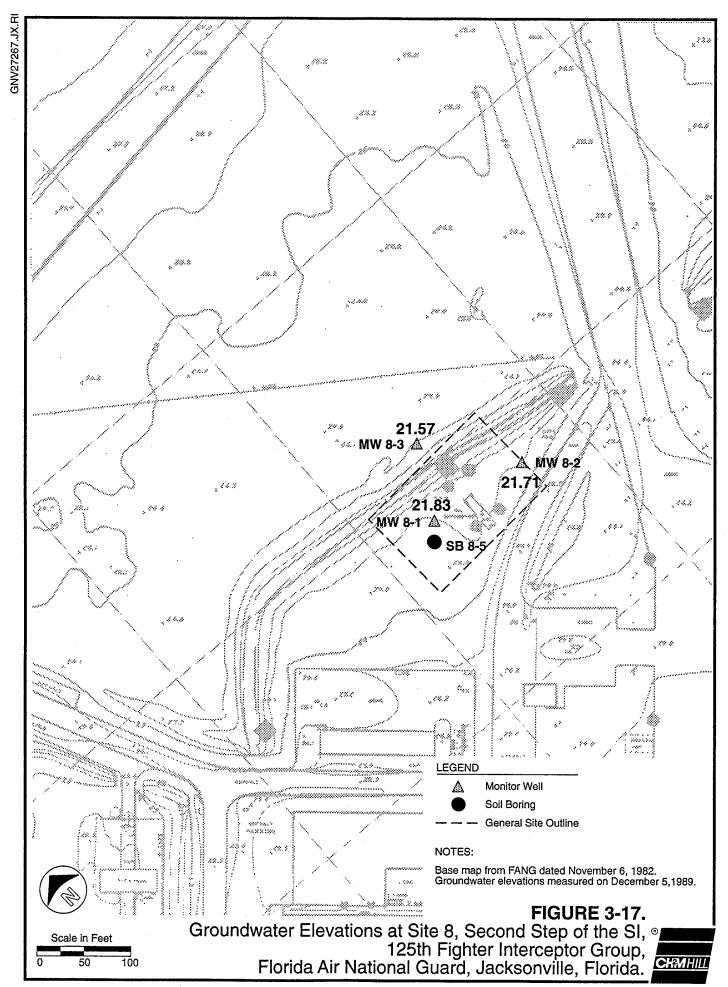












SECTION 4
Data Validation Results

4. DATA VALIDATION RESULTS

The data quality objectives for the SI require data validation in accordance with Level C quality control (QC) guidelines promulgated by the Hazardous Waste Remedial Actions Program (HAZWRAP). Data validation for the first and second steps of the SI is described in detail in the technical memoranda included as Appendixes E and F of this report. A summary explanation of the validation process and results is presented in this section.

Laboratory analytical data generated from samples collected during the SI were prepared as data packages consisting of forms and control charts that conformed to the requirements for Level C deliverables. The forms presented and summarized the raw data and were reviewed against the criteria established in validation guidelines.

For this project, data validation was performed according to the guidelines presented by HAZWRAP for Level C when available. When analyses were not covered by these guidelines, data were reviewed against either laboratory data validation functional guidelines from the U.S. Environmental Protection Agency (EPA) or similar procedures outlining sample holding times, initial calibration, continuing calibration, matrix spike, blank spike, and blank versus sample results for the method involved.

The raw data were reviewed to verify sample identity, instrument calibration, detection limits, numerical computations, accuracy of transcriptions, and chemical interpretations. QC samples were processed to demonstrate that the analytical results were within laboratory prescribed criteria for accuracy and precision. Data were accepted without qualification when all QC and quality assurance measures were demonstrated to have been met.

For data that did not strictly meet the criteria, the data validation technical memoranda explain the reasons and provide tables that identify the affected data by letter flags. The flags also appear on the data summaries that are used as

tables in the report to indicate that there is some question about the quality of the analytical results reported.

Data that are found to be unusable are given an "R" qualifier. Such data are rejected because the compound may or may not be present and the data are not considered suitable for use in a preliminary risk assessment. No data from the SI were rejected.

Two groundwater samples (3E-GW-WP8 and 1-GW-WP4) exceeded holding times for analysis of volatile aromatic compounds. No reportable concentrations of these analytes were measured in the samples. Losses of volatile organics may have occurred in these samples, which creates some uncertainty in the data. Samples from other well points and monitor wells in the vicinity of the affected well points suggest volatile organics are not widespread at these sites.

Constituents that were detected in sample blanks included bis(2-ethyl-hexyl)phthalate, acetone, chromium, lead, and chloroform. Analytes that were identified at concentrations less than five times the value in the laboratory blanks were flagged with a "B" qualifier. These data may be eliminated from consideration in the preliminary risk assessment, particularly for common laboratory contaminants, if they appear to be unrelated to the sites.

Data may be flagged if biases may be present or concentrations are estimated, such as with unacceptable surrogate spike recoveries and/or precision criteria. In such circumstances, the reported constituents are known to be present but there is uncertainty about the concentrations. These data are used in risk assessments as positive results but do create uncertainties in the associated risk estimates.

For both steps of the SI, the laboratory organics and inorganics data were reviewed and validated using the HAZWRAP Level C and EPA guidelines and were found to be acceptable with the qualifications detailed in Appendixes E and F. Wet chemistry data were reviewed and validated using HAZWRAP Level C guidelines and were accepted without qualification.

SECTION 5
Sampling and Analysis Results

5. SAMPLING AND ANALYSIS RESULTS

5.1 FIRST STEP OF THE SITE INVESTIGATION

The results from the first step of the SI include data from soil organic vapor headspace analyses, floating hydrocarbon measurements, and laboratory analyses of surface water, groundwater, soil, and sediment samples. Data validation for the laboratory analyses is discussed briefly in Section 4 and more completely in the technical memorandum provided as Appendix E.

The nature and extent of the contamination related to past activities at the eight sites at FANG is discussed in this section. Where appropriate, water quality data are compared to maximum contaminant levels (MCLs) specified in Florida drinking water standards, recommended groundwater criteria from FDER⁴, or surface water criteria from FAC Chapter 17-3.

5.1.1 Soil Organic Vapor Headspace Analyses

Fifteen of the 54 soil samples had an OVA reading in excess of 500 ppm, which is the FAC Chapter 17-70 criterion for excessive petroleum hydrocarbon contamination in soils. The criterion was exceeded in one or more soil samples from Sites 1, 2, 3E, 4, and 8. The results of the soil organic vapor headspace analyses are shown in Table 5-1.

Several of the samples for headspace analyses were split; the split sample was analyzed immediately and the other was cooled and analyzed later in the day, as described in the *Site Investigation Sampling and Analysis Plan*². No clear trend was seen in the split samples, although most of the later OVA readings were higher. Many soil samples exhibited an odor characteristic of swampy organic soils, and some with high OVA readings had no petroleum hydrocarbon odors, staining, or other contamination characteristics. Methane produced from degradation of naturally occurring organics or organic contaminants may be the cause of some high OVA readings. Laboratory analyses of the soils (see Section 5.1.4) confirmed the qualitative evidence of little or no petroleum hydrocarbon contamination of soils.

GNV405E/020.51 5-1

5.1.2 Floating Hydrocarbon Measurements

Because of the large quantities of fuel reportedly spilled at several sites, the well points were checked for the presence of floating hydrocarbons. An oil/water interface probe was used to detect measurable thicknesses of floating hydrocarbons, and the groundwater in the well points was visually examined during sampling for hydrocarbon sheen. Neither floating hydrocarbons nor hydrocarbon sheen was detected in any of the well points.

5.1.3 Groundwater Contaminant Concentrations

Groundwater samples from all well points were analyzed by CH2M HILL for volatile organics as indicator parameters, using EPA Methods 601, 602, or 624. Semivolatile organics (EPA Method 625), polynuclear aromatics (EPA Method 610), ethylene dibromide (EDB), and priority pollutant metals were analyzed for in samples taken from well points believed to be the most contaminated at the sites, as indicated by well point location, soil observations, and OVA readings. For selected samples, analyses were performed to obtain total organic carbon (TOC) data. Total suspended solids (TSS) concentrations were obtained for selected samples to evaluate the effect of solids on metals levels.

The laboratory results for volatile organic constituents are summarized in Table 5-2. Groundwater samples from 16 well points showed concentrations in excess of MCLs or FDER criteria. EPA Method 610 and 625 analysis results for polynuclear aromatics, semivolatile organics, and EDB are listed in Table 5-3; semivolatiles were detected in four well points and polynuclear aromatics in one well point. EDB was not detected in any of the groundwater samples analyzed, and naphthalene occurred at levels exceeding the Florida criteria in two well point samples.

As shown in Table 5-4, metals were detected at levels above the Florida criteria in eight groundwater samples. The chromium criterion was exceeded in four well points and the lead criterion was exceeded in five. Table 5-4 also includes results from TSS analyses; the high values reflect the siltiness of many of the well point

samples. Soils contain naturally occurring metals and dissolved metals tend to sorb onto soil particles. Because the reported metals concentrations for groundwater are total values, the high levels of solids in the samples may account for some of the metals detected.

Groundwater sample analysis results at each site are summarized below (concentration values followed by a "J" are estimated):

- Site 1: WP 1-1A exceeded the guidance criterion for total volatile organic aromatics (VOAs) (combined total of benzene, toluene, ethyl benzene, and total xylenes of 50 μg/l) at 55J μg/l. The detected benzene concentration of 41 μg/l exceeded the 1 μg/l MCL and the detected lead concentration of 54.1J μg/l exceeded the 50 μg/l MCL. The lead MCL was also exceeded in WP 1-2 with a concentration of 66.3 μg/l. The 50 μg/l chromium standard was exceeded in WP 1-2 with a detected concentration of 99.3 μg/l.
- Site 2: Benzene concentrations in WP 2-1 and 2-6 exceeded the MCL of 1 μg/l with values of 5 and 2 μg/l, respectively. The guidance criterion for ethyl benzene of 2 μg/l was exceeded in WP 2-1 and 2-10 with detected concentrations of 7J and 3J μg/l, respectively. Total xylenes and total VOA guidance criteria (both 50 μg/l) were exceeded in WP 2-2 at detected concentrations of 160J μg/l. The lead criterion of 50 μg/l was exceeded in WP 2-6, 2-9, and 2-10 at detected concentrations of 1,200J, 1,100J, and 640J μg/l, respectively.
- Site 3E: The sample from WP 3E-9 exceeded the 1 μg/l vinyl chloride MCL with a detected concentration of 4J μg/l and the 4.2 μg/l guidance criterion for trans-1,2-dichloroethene with a detected concentration of 12J μg/l. WP 3E-6 exceeded the l μg/l MCL for benzene, the 2 μg/l guidance criterion for ethyl benzene, and the 50 μg/l guidance criterion for total VOAs with detected concentrations of 25, 4J, and 53J μg/l, respectively.

- Site 3W: No exceedances were noted.
- Site 4: The 2 μg/l ethyl benzene guidance criterion was exceeded in WP 4-1 at a concentration of 4J μg/l. This well point also had reported concentrations of 1,300J μg/l of benzoic acid and 210 μg/l of 4-methyl phenol.
- Site 5: The 1 μg/l benzene MCL, the 2 μg/l guidance criterion for ethyl benzene, and the 50 μg/l total VOA criterion were exceeded in WP 5-3 with concentrations of 60, 19J, and 81J μg/l, respectively.
- Site 6: The 2 μg/l ethyl benzene criterion was exceeded in WP 6-1 at a concentration of 6J μg/l. The 50 μg/l chromium MCL was exceeded in WP 6-1, 6-2, and 6-3 at detected concentrations of 113, 56.8, and 115 μg/l, respectively.
- Site 7: No exceedances were noted.
- Site 8: The 10 μg/l guidance criterion for combined 1,2- and 1,4-dichlorobenzene was exceeded in WP 8-1 at a detected concentration of 17J μg/l. The 10 μg/l criterion for chlorobenzene was also exceeded with a detected concentration of 35J μg/l. The 1 μg/l MCL for benzene was exceeded at a concentration of 7 μg/l in WP 8-1, which is located where an unlined pit was used as an OWS prior to 1981. WP 8-3 exceeded the 10 μg/l criterion for combined 1,2- and 1,4-dichlorobenzene at a concentration of 34J μg/l. The 1 μg/l benzene standard, the 24 μg/l criterion for toluene, the 2 μg/l criterion for ethyl benzene, the 50 μg/l criterion for total xylenes, and the 50 μg/l total VOA criterion were all exceeded in WP 8-3 at concentrations of 26, 39, 150J, 430, and 645J μg/l, respectively. The 10 μg/l criterion for naphthalene was also exceeded in WP 8-3 at a concentration of 89 μg/l. The 50 μg/l total VOA criterion was exceeded in WP 8-4 at a detected

concentration of 58 μ g/l. The total xylenes criterion was also exceeded in WP 8-4, at a detected concentration of 55 μ g/l.

5.1.4 Soil Contaminant Concentrations

Soil samples were obtained near selected well point locations at selected depths and analyzed for volatile organics, semivolatile organics, polynuclear aromatics, EDB, TOC, polychlorinated biphenyls (PCBs), and metals. A background soil sample was also collected during the second step of the SI from a location not associated with known activities at FANG (see Attachment 1) and analyzed for metals. The results are provided here for comparison with soil samples collected during the first step of the SI.

As shown in Table 5-5, polynuclear aromatics were not detected in any of the soil samples and the only volatile constituent was total xylenes in WP 4-3. The summary of TOC, EDB, PCB, and semivolatile organics data in Table 5-6 shows that EDB and PCBs were not detected in any of the soil samples. The only semivolatile organic constituent detected was bis(2-ethyl-hexyl)phthalate, which was also found in the laboratory method blank.

In the metals data summary in Table 5-7, the highest chromium concentration is $8,600~\mu g/kg$ in WP 8-1. The average chromium level is $2,700~\mu g/kg$, as compared to a reported background concentration of $1,800~\mu g/kg$. Lead was detected at the highest concentration next to WP 8-3 (14,700 $\mu g/kg$), while the remaining samples averaged $4,000~\mu g/kg$. The lead concentration reported for the background sample is $3,400~\mu g/kg$.

5.1.5 Drainageway Contaminant Concentrations

Sediment and surface water samples were collected and analyzed for volatile organics, semivolatile organics, EDB, PCBs, and metals. A background sediment sample was also obtained from a location not associated with known activities at FANG (see Attachment 1) and analyzed for metals.

A summary of volatiles analysis results is given in Table 5-8 and shows volatiles were detected in samples from 6 of the 15 sediment sampling locations and 3 of the 5 surface water sampling locations. The water quality criteria for Class III surface waters in FAC Chapter 17-3.121 do not address volatile organics. None of the volatile organics detected are covered by federal ambient water quality criteria for aquatic organisms.

Table 5-9 summarizes data for semivolatile organics, EDB, and PCBs for sediment and surface water samples. Semivolatile organics were detected in samples from nine of the sediment and one of the surface water sampling locations. EDB was detected in one surface water sample but no sediment samples. No PCBs were detected in any of the sediment samples. The criteria in FAC Chapter 17-3.121 and 17-3.061 for phthalate esters and phenolic compounds are also shown in Table 5-9 and are exceeded for several samples. Phthalates are common laboratory contaminants and were not detected at concentrations much above detection limits.

A summary of the metals data for sediment and surface water samples is provided in Table 5-10 along with the criteria for Class III surface waters from FAC Chapter 17-3.121. Cadmium and chromium were detected at levels above the criteria in surface water samples from R2C and R4C. Silver was found in surface water in concentrations exceeding the criterion at two sample locations. Lead and mercury surface water criteria were each exceeded at one location.

Sample analysis results for each reach are summarized below:

Reach 1: Several volatile organics were detected in sediment samples. Trichlorofluoromethane was found at all three sampling locations and total xylenes were detected at R1D. No other contamination was evident in Reach 1 sediments. The surface water sample at R1C contained 4.7 μg/l of silver, which exceeds the Class III surface water criterion of 0.07 μg/l. Bis(2-ethyl-hexyl)phthalate was also detected at 6 μg/l, above the 3 μg/l criterion, but may be attributable to laboratory contamination.

Mercury above the 0.2 μ g/l criterion was detected in the R1C surface water sample at a concentration of 0.68 μ g/l and was also detected at 0.6 μ g/l in the rinsate blank.

- Reach 2: Minimal contamination was evident in sediment samples. Water samples from R2C indicated cadmium at 9.3 μg/l and chromium at 63.4 μg/l, levels that exceed the Class III surface water criteria of 0.8 to 1.2 μg/l and 50 μg/l, respectively.
- Reach 3: Lead levels appeared high at R3C and total xylenes were detected at R3U in sediment samples.
- Reach 4: Toluene, ethyl benzene, and total xylenes were detected in sediment samples at R4C, which also appeared to have high levels of chromium and lead. The sediment sample at R4U, which was the most upstream sampling point on any of the drainageways associated with the eight sites and therefore expected to have the least contamination, contained many semivolatile constituents. Phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthra-cene, chrysene, bis(2-ethyl-hexyl)phthalate, benzo(b and k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, and naphthalene were detected in the sediment at R4U. Sediment samples at R4U and R4C also contained high lead concentrations.

The contamination at R4U may have originated in OWS discharges to an upstream drainage ditch that is not included in this SI. The OWS collects drainage from a fuel storage facility and a fuel truck parking lot. The contaminants detected in the sediment sample at R4U are indicative of the heavy fuel constituents found in diesel fuels. Also, drainage from the AGE Storage Building enters the drainageway reach through a pipe discharge near R4U. The only semivolatiles detected in any of the other sediment samples in Reach 4 were bis(2-ethyl-hexyl)phthalate and naphthalene.

The surface water in Reach 4 also appeared to be the most contaminated of any sampled. The sample from R4C exceeded the 3 μ g/l Class III surface water criterion for bis(2-ethyl-hexyl)phthalate with a detected concentration of 13 μ g/l. The 1 μ g/l phenol criterion was also exceeded at a concentration of 2,200 μ g/l. The 50 μ g/l chromium criterion, the 0.8 to 1.2 μ g/l cadmium criterion, and the 30 μ g/l lead criterion were all exceeded at concentrations of 122, 21.7, and 41.9 μ g/l, respectively. The surface water contamination detected at R4C may reflect current discharges from the Wash Rack OWS and the upstream OWS.

5.2 SECOND STEP OF THE SITE INVESTIGATION

The results from the second step of the SI include data from soil organic vapor headspace analyses, floating hydrocarbon measurements, and laboratory analyses of surface water, groundwater, soil, and sediment samples. Data validation for the laboratory analyses is discussed briefly in Section 4 and more completely in the technical memorandum provided as Appendix F.

The data results are discussed below as they relate to the nature and extent of contamination attributable to past activities at the eight sites and the downgradient drainageway locations investigated during the second step of the SI. Where appropriate, data are compared to MCLs specified in Florida drinking water standards or to recommended criteria as discussed in Section 5.1.

5.2.1 Soil Organic Vapor Headspace Analyses

Results of soil organic vapor headspace analyses conducted during the first step of the SI indicated areas with potentially excessive soil contamination. During the second step of the SI, soil organic vapor headspace analyses were repeated at three of these locations (Sites 1, 2, and 4). The sampling locations for the headspace analyses are shown in Figures 5-1 and 5-2.

At each location, the soil sample from the hand auger was split into two portions. One portion was analyzed with the OVA as in the first step of the SI; the second portion was analyzed with an activated carbon filter on the OVA to obtain readings of methane concentrations alone.

The results of the headspace analyses are presented in Table 5-11. Readings with the filter are equal to or greater than readings without the filter, which indicates that methane is the dominant organic vapor detected in the soil. The total OVA readings were lower than had been reported during the first step of the SI, possibly because of the lower ambient air temperatures during the second sample collection effort.

5.2.2 Floating Hydrocarbon Measurements

During the sampling of the monitor wells and well points installed as part of the second step of the SI, an oil/water interface probe was used to measure the depth to groundwater and the detectable thickness of any floating hydrocarbons that might be present. The water removed from the monitor wells and well points during purging and sampling was also visually inspected for hydrocarbon sheen. As observed during the first step of the SI, no floating hydrocarbons or hydrocarbon sheen was detected in any monitor wells or well points during the second step of the SI.

5.2.3 Groundwater Contaminant Concentrations

Groundwater samples were collected from all monitor wells and well points installed during the second step of the SI, as well as from the three monitor wells installed by others adjacent to Site 5 as part of an ongoing UST investigation. The samples were analyzed for selected parameters based on the results of the groundwater sampling performed during the first step of the SI. Field-filtered samples were also collected from two well points at Site 2 for analysis of lead for comparison with unfiltered samples, as requested by FDER. Two samples were analyzed for iron, total dissolved solids (TDS), and total hardness to obtain information on the general water quality in the surficial aquifer.

The laboratory results for volatile organic constituents analyzed by EPA Methods 601 and 602 are summarized in Table 5-12. Groundwater samples from four monitor wells showed concentrations in exceedance of MCLs or FDER criteria. Samples for analysis of semivolatile constituents by EPA Method 610 were collected from the three monitor wells at Site 8, the two well points at Site 7, and the well point at Site 3W. No detectable concentrations of semivolatiles were found in any of these groundwater samples. The laboratory results for metals, TDS, and total hardness are summarized in Table 5-13. Florida drinking water standards were exceeded in four of the monitor wells sampled. Table 5-14 summarizes the results of the analysis of filtered and unfiltered samples from Site 6 for total chromium.

Tables 5-12 and 5-13 include values for decontamination water used for gross decontamination (initial rinse) of equipment. Decontamination water was obtained from a hose bib at the Hush House (denoted as HH) near Site 4 and from a hose bib at the Civil Engineering Building (denoted as CE). The EPA 601 parameters detected in these samples are trihalomethanes, organic compounds commonly formed as a result of chlorination at water treatment plants. The total trihalomethane concentration detected in each sample is well below the drinking water standard.

In general, the laboratory results for groundwater samples from the monitor wells show lower concentrations of contaminants than were detected in samples from well points in the same areas. Several factors may contribute to the difference. For instance, contaminants associated with fuel spills tend to be lighter than water and will float on top of the groundwater table, which well points typically penetrate by only 1 or 2 feet. Samples from well points will, therefore, contain water with greater concentrations of contaminants than those from monitor wells, which generally penetrate a deeper water column. In addition, because monitor wells are constructed to filter out more particulates, samples from well points may reflect more contaminants associated with suspended solids, such as metals.

Groundwater sample analysis results at each site are summarized below:

- Site 1: MW 1-1 exceeded the 50 μg/l primary drinking water standard for chromium with a concentration of 152 μg/l. MW 1-2 also exceeded the primary drinking water standard for chromium with a concentration of 112 μg/l and the 300 μg/l secondary standard for iron with a concentration of 41,300 μg/l.
- Site 2: No exceedances were noted.
- Site 3E: MW 3E-1 exceeded the primary drinking water standards for 1,1-dichloroethane (0.3 μg/l) and benzene (1 μg/l) with concentrations of 3.7 and 31 μg/l, respectively. Also in MW 3E-1, the guidance criteria for ethyl benzene (2 μg/l), total xylenes (50 μg/l), and total VOAs (50 μg/l) were exceeded with concentrations of 26, 110, and 175.1 μg/l, respectively. The secondary drinking water standards for TDS (500,000 μg/l) and iron (300 μg/l) were also exceeded in MW 3E-1 at concentrations of 1,860,000 and 241,000 μg/l, respectively.
- Site 3W: No exceedances were noted.
- Site 4: No samples were collected.
- Site 5: MW 5-2 exceeded the 1 μg/l primary drinking water standard for benzene with a concentration of 1.8 μg/l. MW-A, installed by others adjacent to Site 5, exceeded the 2 μg/l guidance criteria for ethyl benzene with a concentration of 36 μg/l. MW-C, also installed by others, exceeded the 1 μg/l primary drinking water standard for benzene with a concentration of 7.5 μg/l.
- Site 6: In the first samples obtained, MW 6-2 exceeded the 50 μg/l primary drinking water standard for chromium with a concentration of 128 μg/l. No chromium was detected in the subsequent filtered

samples from the two Site 6 monitor wells and the three well points. The unfiltered samples from WP 6-4 and WP 6-6 exceeded the standard at 286 and 1,650 μ g/l, respectively. The unfiltered sample collected from MW 6-2 had a chromium concentration of 19.6 μ g/l, which is below the standard.

- Site 7: No exceedances were noted. Chromium was not detected in the filtered sample collected from WP 7-8, but was detected at a concentration of $42 \mu g/l$ in the unfiltered sample.
- Site 8: No exceedances were noted.

5.2.4 Soil Contaminant Concentrations

At Site 8, soil samples were obtained from three borings drilled for monitor well construction and one additional soil boring. The soil samples were analyzed for barium, chromium, and lead, and the results are shown in Table 5-15. The barium and chromium concentrations in all but one soil sample exceed those found in the background sample. The lead concentrations in the soil samples at Site 8 are in the same range as the value for the background sample.

5.2.5 Drainageway Contaminant Concentrations

Sediment and surface water samples were collected at two locations on the drainageway downstream of FANG (DG-1 and DG-2 on Attachment 1) for analysis for volatile organics, semivolatile organics, and metals. For comparison, a background sediment sample was collected from a point on the FANG drainageway system not associated with any known activities at FANG (see Attachment 1). The background sediment sample reportedly contained 58 µg/kg of di-n-butylphthalate, a semivolatile organic constituent that is probably a laboratory contaminant.

A summary of the results of the metals analyses for sediment samples is given in Table 5-16. Barium is the only constituent at concentrations that significantly

exceed that of the background sample: 34,800 and $19,100 \mu g/kg$ at DG-1 and DG-2, respectively, as compared to $9,100 \mu g/kg$ for the background sample. No semivolatile organics were detected in either of the sediment samples, and the only volatile organic was chloroform at $1.5 \mu g/kg$, a level that is probably attributable to laboratory contamination.

In the surface water samples from the drainageway, the mercury concentration at DG-2 of 0.35 μ g/l exceeds the criterion of 0.2 μ g/l. No detectable concentrations of volatile or semivolatile organics were found in the surface water samples at DG-1 and DG-2.

5.3 BACKGROUND SAMPLING

To provide a comparison for samples taken from the eight sites and the drainageways, background soil and sediment samples were collected at locations not associated with any known activities at FANG during the second step of the SI (see Attachment 1). The background samples were analyzed for metals and the results are reported in Tables 5-7 and 5-15 for soils and Tables 5-10 and 5-16 for sediments. Background analyses were not performed for volatile or semivolatile contaminants, as such constituents are not naturally occurring in soils or sediments.

Background samples were not collected for either groundwater or surface water, as concentrations in such samples must be compared to FDER criteria. A location on the drainageway network at FANG that had clearly not been affected by installation activities could not be identified.

Table 5-1
RESULTS OF SOIL ORGANIC VAPOR HEADSPACE ANALYSES
(FIRST STEP OF THE SI)
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

LORIDA	i AIR HAIIOHAI	GUARD, JACKSON VILLI	2, FLORIDA
Well		OVA	
Point	Depth (ft)	Reading (ppm)	Split (ppm)
WP 1-1	1.5 - 2.0	>1000	140
WP 1-2	2.0 - 2.5	>1000	N/A
WP 1-3	1.5 - 2.0	>1000	N/A
WP 1-4	2.0 - 2.5	820	N/A
WP 1-5	2.0 - 2.5	100	N/A
WP 1-6	2.5 - 3.0	60	N/A
WP 2-1	2.0 - 2.5	66	N/A
WP 2-1	4.0 - 4.5	420	N/A
WP 2-2	2.0 - 2.5	20	N/A
WP 2-2	4.0 - 4.5	140	N/A
WP 2-3	2.0 - 2.5	85	N/A
WP 2-3	4.0 - 4.5	220	N/A
WP 2-4	2.0 - 2.5	100	N/A
WP 2-4	4.0 - 4.5	100	N/A
WP 2-5	2.0 - 2.5	40	N/A
WP 2-5	4.0 - 4.5	130	N/A
WP 2-6	4.0 - 4.5	750	N/A
WP 2-7	4.0 - 4.5	1000	N/A
WP 2-8	4.0 - 4.5	1000	N/A
WP 2-9	4.0 - 4.5	750	N/A
WP 2-10	4.0 - 4.5	200	N/A
WP 2-11	4.0 - 4.5	800	N/A N/A
WP 3E-1	NO SAMPLE	NO SAMPLE	N/A
WP 3E-2	3.5 - 4.0	10 SAMITEE	0
WP 3E-3	4.0 - 4.5	40	N/A
WP 3E-4	3.5 - 4.0	50	N/A
WP 3E-5	5.0 - 5.5	20	N/A
WP 3E-6	2.0 - 2.5	500	990
WP 3E-7	3.0 - 3.5	800	N/A
WP 3E-8	NO SAMPLE	NO SAMPLE	N/A
WP 3E-9	3.0 - 3.5	100 SAMI LE	N/A
WP 3W-1	3.5 - 4.0	5	N/A
WP 3W-2	5.0 - 5.5	ő	N/A
WP 3W-3	3.5 - 4.0	5	N/A
WP 3W-4	25 - 30	ŏ	N/A
WP 3W-5	2.5 - 3.0 3.0 - 3.5	ŏ	N/A
WP 4-1	1.5 - 2.0	80 0	520
WP 4-2	3.0 - 3.5	850	N/A
WP 4-3	2.0 - 2.5	>1000	N/A
WP 5-1	1.0 - 1.5	58	N/A
WP 5-2	1.0 - 1.5	70	N/A
WP 5-3	3.0 - 3.5	150	N/A
WP 6-1	3.5 - 4.0	0	4
WP 6-2	3.5 - 4.0	ŏ	N/A
WP 6-3	3.5 - 4.0	ŏ	N/A
WP 7-1	3.5 - 4.0	15	N/A
WP 7-2	3.5 - 4.0	0	N/A
WP 7-3	3.5 - 4.0	40	N/A
WP 7-4	4.0 - 4.5	ő	N/A
WP 7-5	2.5 - 3.0	100	N/A
WP 7-6	5.5 - 6.0	60	N/A
WP 7-7	3.5 - 4.0	0	N/A
WP 8-1	1.5 - 2.0	>1000	380
WP 8-2	2.0 - 2.5	180	N/A
WP 8-3	1.5 - 2.0	30	N/A
WP 8-4	1.5 - 2.0	350	N/A
			-

Table 5-2
SUMMARY OF GROUNDWATER SAMPLE ANALYSES FOR VOLATILES (1991)
FIRST STEP OF THE SI
125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD
JACKSONVILLE, FLORIDA

				H	EPA METHOD 601	D 601					EPA	EPA METHOD 602)D 602					9	EPA METHOD 624	D 624	
	Chloro-	1,1-Di- chloro-	1,1-Di- 1,1,1- Chloro- chloro-Trichloro- Vinyl	1,1-Di- 1,1,1- Chloro- chloro-Trichloro- Vinyl	trans-1,2. Dichloro-	Chloro-	1,3-Di- 1 Chloro- chloro-	chloro-			1,3-Di- Chloro- Bünyl Total chloro-	thyl T	otal ch		1,2-Di- 1,4-Di-		Total Methylene	thylene		H	4-Methyl-
Totalion Co.	over 111	all le	all de	e cultorine	erillelle		oellizette	Denzene	T allegalle I	olumente D	an attache	izenie Ay	9		alizelle o	alizene 25 n	5	an long		y alloheval	Lentanolie
ri Criteria	3800	3800 A 2400 A	4 200 B	1 2	W 7.4	Y I I	e e	10, /5 A	1 18	4	FOT	4 7	4 9	TO A	TO Y	a c/	¥ nc				
WP1-1A *	7	7	7	7	7	٧	7	7	4	-	٦	7	13 J	7	7	7	55 J	NA	NA	NA	NA
WP1-2	7	٧	7	7	7	7	٧	∀	7	7	7	7	7	7	٧	٧	7	AN	NA	NA	NA
WP1-2 Duplicate	7	7	7	7	7	7	7	∀	7	7	7	7	7	7	7	7	7	Y.	NA	NA	NA
WP1-3	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	Ϋ́	NA	N	NA
WP1-4(H)	. ₩	7	7	7	7	7	7	7	٧	7	7	7	7	7	7	7	7	Y.	NA	AN	NA
WP1-5	₹	7	7	7	٧	7	7	7	7	7	7	٧	7	7	7	٧	7	Ϋ́	NA	V	NA
WP1-6	7	7	7	7	7	٧	7	7	7	7	7	7	₹	7	7	7	7	X Y	N A	ΝĄ	NA
WP2-1 **	7	7	7	7	7	7	7	7	v	8	7	7.3	S J	7	∀	7	19 J	Ž	Š	N.	NA.
WP2-2 **	7	7	7	7	7	7	7	٧	٧	٧	7	7	160 J	7	٧	7	160 J	NA	NA A	NA	NA
WP2-6 *	7	7	7	7	7	7	7	٧	7	٧	7	7	7	7	۳	7	7	N A	Ν	NA	NA
WP2-9 *	⊽	7	7	7	7	7	7	7	7	7	7	7	7	7	٧	7	7	Y Y	NA	NA	NA
WP2-10 *	7	7	₽	7	7	7	7	7	7	7	7	3 J	5 J	7	7	7	8 J	NA	NA	NA	NA
WP3E-1	` 7	٧	7	7	٧	7	٦	٦	7	7	7	7	7	7	7	7	7	Ž	8	Ž	Ž
WP3E-2	₹ 7		7	; ⊽	' ⊽	' ⊽	, .	; ⊽	; ⊽	₹ 7	/ V	; v	; v	; T	; v	; T	; v	Ž	Ą	Ž	Y A
WP3E-3	7		7	7	7	7	7	7	7	7	7	7	7	7	7	' ₹	7	Y X	N A	N A	NA
WP3E-4	7	٧	٧	٧	7	7	7	٧	7	٧	7	7	٦	7	٧	٧	٧	Ą	NA	NA	NA
WP3E-5	7	7	₹	7	7	7	7	7	7	7	7	7	7	7	7	7	7	Ą	NA	NA	NA
WP3E-6 *	7	10 J	₹ .	7	7	7	₹	7	25	17	7	4 J	7 J	7	7	7	53 J	Ϋ́	NA	NA	NA
(1) WP3E-6	7	13 J	7	7	24 MJ	1.	7	7	35	13	7	2 J	17	7	7	7	67 J	90	2500 J	9 J	73
WP3E-7	7	7	٧	7	7	7	7	7	7	7	٦	7	7	7	7	7	۳	NA A	NA	NA	NA
WP3E-8(H)	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	٣	NA A	AA	NA	NA
WP3E-8 Duplicate	7	7	7	7	7	7	7	7	7	7	7	7	7	7	٧	7	7	N A	NA	NA	NA
WP3E-9	7	7	7	4 T	12 J	7	7	7	7	7	7	1 J	7	7	7	7	3 J	NA	Y Y	N A	NA
WP3W-1	٧	7	7	7	7	₹	7	7	7	7	7	7	7	7	7	7	7	NA A	NA A	NA	NA
WP3W-2	٧	7	7	7	7	٧	7	7	7	7	7	7	٦	7	7	7	7	NA	NA	NA	ΝΑ
WP3W-3	7	٧	٧	7	7	٧	7	٧	7	7	7	7	7	7	7	7	7	NA	NA	NA	NA
WP3W-4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	NA	NA	NA	NA
WP4-1	7	7	7	7	7	7	7	٧	7	m	7	4 L	76	7	7	7	33 J	Ϋ́	Ϋ́ V	N.	X
WP4-2	7	7	7	7	7	7	٧	7	7	7	٧	2.3	7	7	7	7	2 J	Ž	N Y	X	Z.
WP4-3	7	٧	٧	7	٧	7	7	7	7	-	٧	7	က	7	٧	7	4	NA A	NA	X Y	NA
WP4-3 Duplicate	7	7	7	٣	7	1.5	J Al	7	v	6	1	7	48	٧	7	7	99	NA A	NA	N A	NA

Table 5-2 (Continued)

EPA METHOD 624 EPA METHOD 602 EPA METHOD 601

Controls Collisists Collisist			1,1-Di- 1,1,1-	1,1,1		trans-1,2-		1,3-Di- 1,	1,3-Di- 1,2&1,4-Di-						1,3-Di-	1,2-Di- 1,4-Di-	,4-Di-					
1 1 2 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	Location	Chloro- methane	chloro-' ethane	richloro- ethane	Vinyl chloride	Dichloro- ethene	Chloro- benzene	chloro- benzene		Benzene 7	Coluene b	Chloro- enzene b	Ethyl enzene X			chloro- e	thloro- enzene	Total Me VOA Ch	thylene iloride A	cetone	-Hexanone	4-Methyl-
11 4 4 6 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	WP5-1	7	7	7	7	7	7	7	7	7	7	7	7	7	4	7	4	7	NA A	NA	NA	NA
The control of the co	WPS-2	-	7	7	7	٧	٧	7	7	7	٧	٧	7	7	7	7	٧	7	AN	NA	NA	NA A
1 1 4 1 1 1 4 1 1 1 4 1 1 1 4 1 1 1 4 1	WP5-3	7	7	7	7	7	7	7	7	09	-	7	19 J	-	7	7	7	81 J	NA	NA A	NA	NA
La ci	WP6-1	<u>.</u>	7	1.3		7	7	7	7	7	7	7	6 3	-	7	7	7	7 J	AA A	AA	NA	NA
A C C C C C C C C C C C C C C C C C C C	WP6-2	7	7	7	7	7	7	7	7	7	7	7	7	7	٧	7	7	7	NA	Ϋ́	NA	NA
4 d d d d d d d d d d d d d d d d d d d	WP6-3	₹	7	7	₹.	7	7	7	7	7	7	7	7	7	7	7	7	7	NA	NA V	NA A	NA
A	WP7-1	7	7	7	7	7	7	7	⊽	7	7	٧	7	٧	٧	7	7	7	NA A	Ā	NA	NA
Color Colo	WP7-3	7	7	7	7	7	7	7	7	7	7	7	7	7	٧	7	7	7	NA	N A	NA	NA
A	WP7-4	7	7	٧	7	7	7	٧	7	7	7	7	7	7	٧	7	7	7	NA	N A	NA	NA
Car	WP7-6	7	7	7	7	7	7	7	7	7	7	7	7	7	٧	7	7	7	NA	N A	NA	NA
Light L	WP7-7	7	٧	7	7	7	٧	7	7	7	7	7	7	7	7	7	₹	7	NA	A'A	NA	NA
Duplicate c1	WP8-1	٧	7	7	7	7	35]		17.3	7	7	35	12 J	28	9	17 X	٦	49 J	Ą	NA	Ν	Ϋ́Z
Ouplified to 4 4	WP8-2	٧	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	NA	NA	NA	N.
(1497) 4	WP8-2 Duplicate	7	7	7	7	7	٧	7	7		7	7	٧	7	7	7	7	٧	NA A	NA	NA	NA
A	WP8-3	7	7	7	1 &		. 6	7	. ¥.		39	6	150 J	430	7	34 X	7	645 J	Ą	NA A	NA	NA
lank	WP8-4	₹	7	7	7	7	7	2 J	2 3		6	7	7	55	7	2 X	7	28	NA	NA	NA	NA
lank	Blanks (ug/l)													•								
1914 *	Equipment Blank	7	7	7	7	٧	7	₹.	7	7	7	7	7	7	7	7	7	7	NA	Ϋ́	NA	NA
4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Equipment Blank *	٧	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	NA	Ϋ́	NA	NA
* * * * * * * * * * * * * * * * * * *	Field Blank	⊽	7	7	7	٧	7	7	7	7	7	7	7	7	7	7	7	7	NA	NA	A'N	NA
• 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Field Blank *	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	NA	Y Y	NA	NA
4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Travel Blank	7	7	7	7	7	7	7	7	7	7	٧	7	٧	7	7	7	7	NA	A A	NA	NA
4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Travel Blank *	7	7	7	٧	٧	7	٧	7	7	7	7	7	7	7	7	7	7	NA	Y V	Ν	NA
	Travel Blank * *	7	٧	٧	7	₹	7	7	7	7	7	7	7	7	7	7	7	7	NA	A'A	NA	NA
	Method Blank	7	٧	7	٧	7	7	7	٧	٧	7	7	٧	٧	7	7	7	٧	١٥,	٠٥	01 v	<10

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

NA = Analyte Not Analyzed.

* = Samples And Blanks Collected 6/15/89, All Others 6/9/89.

[&]amp; = Combined Vinyl Chloride And Dichlorodifluoromethane (Used Packed Column Instead Of Capillary Column To Meet Holding Time). X = Combined 1,2 & 1,4 Dichlorobenzene (Used Packed Column Instead Of Capillary Column To Meet Holding Time). ** = Samples And Blanks Collected 6/13/89, All Others 6/9/89.

^{(1) =} Analysis By EPA Method 624.

M = Total 1,2-Dichloroethene.
A = FDER Guidance Concentration.
B = Florida Drinking Water Standard.
H = Missed Holding Time
Total VOA Defined by FAC 17-70 As Total Of Benzene, Toluene, Xylene, And Ethyl Benzene.

Table 5-3
SUMMARY OF GROUNDWATER SAMPLE ANALYSES FOR
SEMIVOLATILES, POLYNUCLEAR AROMATICS, AND EDB (ug/l)
FIRST STEP OF THE SI
125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD
JACKSONVILLE, FLORIDA

	EPA	A METHOD 610	210				EP.	EPA METHOD 625	v.		
Location	Napthalene	2-Methyl- napthalene	1-Methyl- napthalene	1,3-Dichloro- benzene	1,3-Dichloro- 1,4-Dichloro- 4-Methyl- Benzoic benzene benzene phenol Acid	4-Methyl- phenol	Berzoic	2-Methyl- Napthalene napthalene	2-Methyl- napthalene	Bis(2-ethyl- hexyl)phthalate	EDB
F1 Criteria	10 A			10 A	. 75C			10 A			0.02 A
WP1-1A *	\$	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP1-2	NA	NA	NA	<10	~10	~10	9	<10	<10	4 BJ	J <0.02
WP1-3 *	\$	\$	\$	NA	NA	NA	NA	NA	NA	NA	NA
WP1-4*	4	4	7	NA	NA	NA	NA	NA	NA	NA	NA
WP1-5 *	4	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP1-6 *	7	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-1	4	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-2	4	4	7	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-3	4	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-4	4	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-5	4	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-6	NA	NA	NA	<10	<10	9 7	\$50	<10	~10	3 BJ	
WP3E-8	7	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-8 Duplicate	4	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3E-9	73	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3W-1	4	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3W-2	4	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3W-3	73	4	4	NA	NA	NA	NA	NA	NA	NA	NA
WP3W-4	4	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP4-1	NA	NA	NA	40	94	210	1300	~ 40	9	<40	<0.02
WP4.2 *	7	7	4	NA	NA	NA	NA	NA	NA	NA	NA
WP4.3 *	ß	\$	\$	NA	NA	NA	NA	NA	NA	NA	NA
WP4-3 Duplicate *	 \$	∵	?	NA	NA	NA	NA	NA	NA	NA	NA
WP5-3 *	\$	4	4	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-3 (Continued)

2-Methyl- 1,3-Dicthoro- 1,4-Dicthoro- 6,4-Methyl- Berizoir 2-Methyl- Bis/2-ethyl- 1,3-Dicthoro- 1,4-Dicthoro- 6,4-Methyl- Berizoir 3-Methyl- Bis/2-ethyl- 1,3-Dicthoro- 1,4-Dicthoro- 1,4-Dicthoro	2-Methyl- n Napthalene napthalene 2	l	EPA	A METHOD 610) 				EP	EPA METHOD 625	25		
Napitialene	Naptitalene			2-Methyl-	1-Methyl-	1,3-Dichloro-	1,4-Dichloro-	4-Methyl-	Benzoic		2-Methyl-	Bis(2-ethyl-	
2 2 2 2 NA	cate *	- 1	apthalene	napthalene		benzene	benzene	phenol	Acid	Napthalene r	apthalene		EDB
2	Section Sect		4	4	4	NA	NA	NA	NA	NA	NA	NA	X
State Stat	Section Sect		4	77	4	NA	NA	NA	NA	NA	NA	NA	N
Carting of the color of the c	NA	-	4	77	77	NA	NA	NA	NA	NA	NA	NA	N
NA	NA		4	77	77	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA		4	7	4	NA	NA	NA	NA	NA	NA	NA	A
icate* 2	licate *		NA	NA	NA		7 J	-	-	7	4	6 BJ	V
	licate *	*	4		7		NA			NA	NA	NA	N
89 45 28 NA	88 45 28 NA	Duplicate *	4	7	7		NA			NA	NA	NA	N
4 2 2 4 4 10 410 450 410 410 410 410 410 410 410 410 410 41	A	*	88	45	28		NA			NA	NA	NA	NA
) 2 2 2 40 410 410 450 410 410 410 2 2 2 410 410 410 450 410 410 2 2 2 410 410 410 450 410 410 2 2 2 410 410 410 410 410 410 2 2 2 2 42 2 2 2 2 2 2 2 2 2 2 2 2 2 2		*	4	4	4		NA			NA	NA	NA	N.
4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Sug∕A)											
4 4 4 40 410 450 410 410 40 40 40 40 40 40 40 40 40 40 40 40 40	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		4	4	4	<10	<10	~10	9 2	<10	6 7	5 B	5 BJ <0.02
4 4 4 40 410 450 410 410 40 40 410 40 410 40 410 410 41	4	ment	4	4	77	<10	<10	9	SS .	<10	~10	3 B	3 BJ <0.02
4 4 4 40 410 410 450 410 410 4 4 4 4 4 4 4 4 5 4 4 4	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		4	4	7	~10	<10	F	95	~10	2 10	<10	<0.02
nt *	14*	q	4	4	4	<10	<10	P	S	<10	~ 10	3 BJ	J <0.02
nt*	nt *		4	4	4								
4 4	44	ment *	4	4	7								
<2 <2	4	*	7	4	77								
,		q *	4	7	4			÷					

Notes:

B = Analyte Was Not Detected Above Ten Times The Value Reported In The Laboratory Blank. <= Analyte Was Analyzed For But Not Detected Above The Reported Value.

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise. * = Samples Collected 6/15/89, All Others 6/13/89.

NA = Not Analyzed. A = FDER Guidance Concentration.

C = Florida Drinking Water Standard.

Table 5-4 SUMMARY OF GROUNDWATER SAMPLE ANALYSES FOR METALS, TOC, AND TSS (ug/1) FIRST STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	As	Ba	Cd	Cr	Pb	Hg	Se	Ag	TOC	TSS
F1 Criteria	50 A	1000 A	10 A	50 A	50 A	2 A	10 A	50 A		
WP1-1A *	2.8 J	NA	NA	NA	54.1 J	NA	1.4 J	NA	NA	NA
WP1-2	7.2 J	342	4.5 J	99.3	66.3	0.2 J	0.94 J	<4.4	95800	NA
WP1-2 Duplicate	9.2 J	378	3.4 J	116	67.2	0.2 J	<0.85	<4.4	NA	NA
WP1-3	NA	NA	NA	NA	4 B	NA	NA	NA	NA	NA
WP1-4	NA	NA	NA	NA	34.4	NA	NA	NA	NA	NA
WP1-5	NA	NA	NA	NA	4.4 B	NA	NA	NA	NA	NA
WP1-6	NA	NA	NA	NA	5.8	NA	NA	NA	NA	429000
WP2-6 *	NA	NA	NA	NA	1200 J	NA	NA	NA	NA	NA
WP2-9 *	NA	NA	NA	NA	1100 J	NA	NA	NA	NA	NA
WP2-10 *	NA	NA	NA	NA	640 J	NA	NA	NA	NA	NA
WP3E-1	NA	NA	NA	NA	26.8	NA	NA	NA	NA	NA
WP3E-2	NA	NA	NA	NA	6.8	NA	NA	NA	NA	NA
WP3E-3	NA	NA	NA	NA	2.6 B	NA	NA	NA	NA	NA
WP3E-4	NA	NA	NA	NA	9.5	NA	NA	NA	NA	NA
WP3E-5	NA	NA	NA	NA	4.2 B	NA	NA	NA	NA	NA
WP3E-6 *	6 J	574	<1.7	46 M	31.2 J	0.41 L	1.5 J	<4.4	374000	248000
WP3E-8`	NA	NA	NA	NA	3.9 B	NA	NA	NA	NA	NA
WP3E-8 Duplicate	NA	NA	NA	NA	6.4	NA	NA	NA	NA	NA
WP3E-9	NA	NA	NA	NA	6.7	NA	NA	NA	NA	NA
WP3W-1	NA	NA	NA	NA	5.7	NA	NA	NA	NA	NA
WP3W-2	NA	NA	NA	NA	6.8	NA	NA	NA	NA	NA
WP3W-3	NA	NA	NA	NA	4 B	NA	NA	NA	NA	674000
WP3W-4	NA	NA	NA	NA	29.3	NA	NA	NA	NA	NA
WP4-1	5.2 J	34.1 J	3.1 J	25.7	10.7	0.2 J	<0.85	<4.4	306000	NA
WP4-2	NA	NA	NA	NA	3.8	NA	NA	NA	NA	424000
WP4-3	NA	NA	NA	NA	18.5	NA	NA	NA	NA	NA
WP4-3 Duplicate	NA	NA	NA	· NA	16.4	NA	NA	NA	NA	NA
WP5-3	2.7 Ј	48 J	4 J	7.7 J	2.2 B	0.16 J	<0.85	<4.4	NA	NA
WP6-1	1 J	216	<1.7	113	32.4	0.53 J	<0.85	<4.4	NA	NA
WP6-2	<0.68	121 J	<1.7	56.8	12.4	0.41 J	<0.85	<4.4	NA	NA
WP6-3	<0.68	245	<1.7	115	21.2	0.45 J	<0.85	<4.4	NA	NA
WP7-1	NA	NA	NA	NA	5.9	NA	NA	NA	NA	NA
WP7-3	NA	NA	NA	NA	4.9 J	NA	NA	NA	NA	NA
WP7-4	NA	NA	NA	NA	5.4	NA	NA	NA	NA	NA
WP7-6	NA	NA	NA	NA	7.9	NA	NA	NA	NA	NA
WP7-7	NA	NA	NA	NA	10.6	NA	NA	NA	NA	NA
WP8-1	3 Ј	334	3.8 J	7.5 J	5.9	0.49 J	<0.85	<4.4	93200	NA
WP8-2	NA	NA	NA	NA	14.6	NA	NA	NA	NA	NA
WP8-2 Duplicate	NA	NA	NA	NA	26.5	NA	NA	NA	NA	NA
WP8-3	NA	NA	NA	NA	1.9 B	NA	NA	NA	NA	451000

Table 5-4 (Continued)

Location	As	Ba	Cd	Cr	Pb	Hg	Se	Ag	TOC	TSS
WP8-4	NA	NA	NA	NA	5.4	NA	NA	NA	NA	NA
(Blanks)	•									
Equipment Blank 1	<0.68	3.4 B	<1.7	<3.2	2.7 B	<0.15	<0.85	<4.4	<1000	NA
Equipment Blank 2	NA.	NA	NA	NA	2 B	NA	NA	NA	NA	NA
Equipment Blank 3 *	NA	NA	NA	NA	3.9	NA	NA	NA	NA	NA
Field Blank 1	<0.68	4.4 B	<1.7	<3.2	0.58 B	<0.15	<0.85	<4.4	<1000	NA
Field Blank 2	NA.	NA	NA	NA	0.93 B	NA	NA	NA	NA	NA
Field Blank 3 *	NA	NA	NA	NA	4.4	NA	NA	NA	NA	NA
Travel Blank 1	<0.68	2.1 B	<1.7	<3.2	3 B	<0.15	<0.85	<4.4	<1000	NA
Travel Blank 2	NA	NA	NA	NA	1.1 B	NA	NA	NA	NA	NA
Travel Blank 3*	NA	NA	NA	NA	2 B	NA	NA	NA	NA	NA
Method Blank									<1000	<4000

B = Analyte Was Not Detected Above Five Times The Value Reported In The Laboratory Blank.

NA = Analyte Was Not Analyzed.

M = Duplicate Precision Was Not Met. It Is Not Possible To Determine Whether The Resulting Bias Is High Or Low.

< = Analyte Was Analyzed For But Not Detected Above The Reported Value.</p>

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

L = Analyte Was Present But The Reported Value May Be Biased Low; The Actual Value Is Expected To Be Higher.

^{* =} Samples Collected 6/15/89, All Others 6/9/89.

A = Florida Drinking Water Standard.

Table 5-5
SUMMARY OF SOIL SAMPLE ANALYSES FOR
POLYNUCLEAR AROMATICS AND VOLATILES (ug/kg)
FIRST STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	Depth (ft)	Total PNAs	Total 8010s	Total 8020s *	Total Xylenes
Location	Depth (It)	IIIAS	00103	00203	Aylenes
WP1-1	0.5-1.0	ND	ND	ND	ND
WP1-1 Duplicate	0.5-1.0	ND	ND	ND	ND
WP1-2	3.5-4.0	ND	ND	ND	ND
WP1-3	2.0-2.5	NA	ND	ND	ND
WP1-4	2.5-3.0	ND	ND	ND	ND
WP3E-1	3.5-4.0	ND	ND	ND	ND
WP3E-6	1.5-2.0	ND	ND	ND	ND
WP3E-6	3.5-4.0	ND	ND	ND	ND
WP3E-7	3.5-4.0	ND	ND	ND	ND
WP3W-1	4.0-4.5	ND	ND	ND	ND
WP3W-5	3.5-4.0	ND	ND	ND	ND
WP4-1	1.0-1.5	NA	ND	ND	ND
WP4-1 Duplicate	1.0-1.5	NA	ND	ND	ND
WP4-1	3.0-3.5	ND	ND	ND	ND
WP4-2	2.5-3.0	ND	ND	ND	ND
WP4-3	0.5-1.0	ND	ND	ND	600
WP5-2	2.0-2.5	ND	ND	ND	ND
WP5-3	1.0-1.5	ND	ND	ND	ND
WP5-3	4.0-4.5	ND	ND	ND	ND
WP6-1	4.5-5.0	NA	ND	ND	ND
WP6-2	4.5-5.0	NA	ND	ND	ND
WP7-2	3.5-4.0	ND	ND	ND	ND
WP7-5	3.5-4.0	ND	ND	ND	ND
WP8-1	2.0-2.5	NA	ND	ND	ND
WP8-3	2.5-3.0	ND	ND	ND	ND
WP8-4	2.5-3.0	ND	ND	ND	ND
WP8-4 Duplicate	2.5-3.0	ND	ND	ND	ND
(Blanks)					
Method Blank		ND	ND	ND	ND

Notes:

ND = Analytes Analyzed For But Not Detected.

NA = Analyte Was Not Analyzed.

^{* =} Except For Total Xylenes.

Table 5-6 SUMMARY OF SOIL SAMPLE ANALYSES FOR TOC, EDB, PCBs, AND SEMIVOLATILES (ug/kg) FIRST STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	Depth (ft)	тос	EDB	Total PCBs	Bis(2-ethyl- hexyl) phthalate	
WP1-3	2.0-2.5	10200000	<0.2	NA	140 B	
WP3E-6	1.5-2.0	NA	NA	ND	NA	
WP3E-6	3.5-4.0	NA	NA	ND	NA	
WP4-1	1.0-1.5	12000000	<0.2	NA	37 B	
WP4-1 Duplicate	1.0-1.5	6520000	<0.2	NA	<350	
WP5-2	2.0-2.5	NA	NA	ND	NA	
WP5-3	1.0-1.5	NA	NA	ND	NA.	
WP5-3	4.0-4.5	NA	NA	ND	NA	
WP8-1	2.0-2.5	2110000	<0.2	NA	77 B	
(Blanks)						
Method Blank		<1000	<0.2	ND	37 B	

Notes:

B = Analyte Was Not Detected Above Ten Times The Value Reported In The Laboratory Blank.

NA = Analyte Was Not Analyzed.

ND = Not Detected.

< = Analyte Was Analyzed For But Not Detected Above The Reported Value.</p>

Table 5-7
SUMMARY OF SOIL SAMPLE ANALYSES FOR

METALS (ug/kg) FIRST STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	Depth (ft)	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
WP1-1	0.5-1.0	NA	NA	NA	NA	4300 K	NA	NA	NA
WP1-1 Duplicate	0.5-1.0	NA	NA	NA	NA	4400 K	NA	NA	NA
WP1-2	3.5-4.0	NA	NA	NA	NA	4100 K	NA	NA	NA
WP1-3	2.0-2.5	950 J	5900 J	<210	1400	4700 K	<19	<110	<550
WP1-4	2.5-3.0	NA	NA	NA	NA	2000 K	NA	NA	NA
WP3E-1	3.5-4.0	NA	NA	NA	NA	9000 K	NA	NA	NA
WP3E-6	1.5-2.0	NA	NA	NA	NA	2800 K	NA	NA	NA
WP3E-6	3.5-4.0	NA	NA	NA	NA	2100 K	NA	NA	NA
WP3E-7	3.5-4.0	NA	NA	NA	NA	4000 K	NA	NA	NA
WP3W-1	4.0-4.5	NA	NA	NA	NA	5300 K	NA	NA	NA
WP3W-5	3.5-4.0	NA	NA	NA	NA	5400 K	NA	NA	NA
WP4-1	1.0-1.5	180 J	3200 J	<190	2300	3500 K	<17	220 J	<490
WP4-1 Duplicate	1.0-1.5	1200 K	4200 J	<190	3000	3200 K	<17	170 J	<490
WP4-1	3.0-3.5	NA	NA	NA	NA	2500 K	NA	NA	NA
WP4-2	2.5-3.0	NA	NA	NA	NA	2700 K	NA	NA	NA
WP4-3	0.5-1.0	NA	NA	NA	NA	5800 K	NA	NA	NA
WP5-2	2.0-2.5	220 J	2800 J	<210	4700	2800 K	<19	<110	<550
WP5-3	1.0-1.5	1000 J	4100 J	620	4900	4300 K	<17	130 J	<490
WP5-3	4.0-4.5	350 J	3400 J	<210	2700	3300 K	<19	330 J	<550
WP6-1	4.5-5.0	330 J	4700 J	<210	2700	800 K	<19	190 J	<550
WP6-2	4.5-5.0	280 J	5300 J	<210	2800	1600 K	<19	120 J	<550
WP7-2	3.5-4.0	NA	NA	NA	NA	8100 K	NA	. NA	NA
WP7-5	3.5-4.0	NA	NA	NA	NA	3200 K	NA	NA	NA
WP8-1	2.0-2.5	1100 J	51900	<210	8600	7600 K	<19	<110	<550
WP8-3	2.5-3.0	NA	NA	NA	NA	14700 K	NA	NA	NA
WP8-4	2.5-3.0	NA.	NA	NA	NA	4600 K	NA	NA	NA
WP8-4 Duplicate	2.5-3.0	NA	NA	NA	NA	2400 K	NA	NA	NA
Background *	1.0-2.0	140	3100	< 190	1800	3400	< 86	< 130	< 800

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

K = Analyte Was Present But The Reported Value May Be Biased High; The Actual Value Is Expected To Be Lower.

NA = Analyte Was Not Analyzed.

< = Analyte Was Analyzed For But Not Detected Above The Reported Value.

^{* =} Background Soil Sample Collected 11/28/89 During Second Step Of SI.

Table 5-8

SUMMARY OF SEDIMENT AND SURFACE WATER

SAMPLE ANALYSES FOR VOLATILES

FIRST STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	Trichloro- fluoro- methane	Methylene Chloride		Tert-Butyl Methyl Ether	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Total VOA (1)	1,4-Di- chloro- benzene	1,2-Di- chloro- benzene	Bromo- methane
Sediment (ug/kg))											
R1U	400 J		<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R1C	600 J	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R1D	400 J	-5 00	<100	<100	<100	<100	<100	200	200	<100	<100	<100
1 C.O. *	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	≺100
1 M.O. *	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R2U	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R2C	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R2D	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R3U	<100	<500	<100	<100	<100	<100	<100	800	800	<100	<100	<100
R3C	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R3D	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R4U	<100	<500	<100	<100	<100	<100	<100	<100		100 J	<100	100
R4C	<100	<500	<100	<1000	<1000	<1000	1000	6000	7000	<100 ⋅	<100	<100
R4C Duplicate	<100	<500	<100	<1000	<1000	1000	<1000	7000	8000	200 J	* 800 J	300
R4D	<100	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
R4D Duplicate	400 J	<500	<100	<100	<100	<100	<100	<100	<400	<100	<100	<100
4 ows	400 J	< 500	<100	<100	<100	<100	<100	300	300	<100	<100	<100
Water (ug/l)												
R1C	<1	<5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1
R2C	<1	< 5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1
R3C	<1	7	-	<1	<1	<1	<1	<1	<4	<1	<1	<1
R4C	<10	430	J 29 J	79 J	470 J	1600 J	100 Ј	650 J	2820 J	<1	<1	<1
R4C Duplicate	<10	450	J 30 J	120 J	_	-				<1	<1	<1
4 OWS	<1	<5	<1	1 J	4 J	7 N	6 J	17 J	34 JN	< 1	<1	<1
Blanks (ug/l)												
Trip	<1	€5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1
Rinse	<1	⋖ 5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1
Method	<1	< 5	<1	<1	<1	1 J	<1	<1	1 Ј	<1	<1	<1

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

N = Analyte Was Not Detected Above 5 Times The Value Reported In The Laboratory Blank.

⁼ Analyte Was Analyzed For But Not Detected Above The Reported Value.

^{(1) =} Total VOA Defined by FAC 17-70 As Total Of Benzene, Toluene, Xylene, and Ethyl Benzene.

Total VOA Calculated Only For Samples With Detectable Concentrations.

^{* = 1} C.O. And 1 M.O. Were Sediment Samples Collected On A Drainage Feature Leading From The OWS Inlet On The West Side Of Site 1. 1 C.O. Was Collected At The Inlet Structure Overflow and 1 M.O. Was Collected Midway Between The Inlet And Reach 3 (See Attachment 1 For Locations)

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA SUMMARY OF SEDIMENT AND SURFACE WATER SAMPLE ANALYSES FOR SEMIYOLATILES, EDB, AND PCB FIRST STEP OF THE SI Table 5-9

NUMBER (Appl.) 469	Location	Phenan- threne	Phenan- Anthra- Fluoran- threne cene thene	Fluoran- thene	Pyrene	Benzo(a)- anthracene	Chrysene	Bis(2-ethyl- hexyl)phthalate	Benzo(b)ff- uoranthene	Benzo(k)ff- uoranthene	Benzo(a)- pyrene	Indeno(1,2, 3-cd)Pyrene	Benzo(g,h, i)perylene	Napthalene	2-Methyl- napthalene	Phenol	EDB	Total PCBs
4.00 4.00	Sediment (ug/kg)																	
1, 10, 10, 10, 10, 10, 10, 10, 10, 10,	R1U	•	600	999	999		999	•	999	·	999	009≥	999	~ 009	009		NA	S
Color Colo	RIC	€560	€560	€560	€560		560		~260		€560	€560	€260	€560	€560	•	60.3	Z
441 441 441 441 441 441 441 441 441 441	RID	4 460	~ 460	4 460	<460		<460		460		<460	~ 460	< 460	<460	<460		¥.	2
4.50 4.50	10.0	410	<410	410	6410		<410		<410		<410	~410	<410	<410	<410			X
Harmon Line	1 M.O.	<430	<430	<430	<430		< 430	130			<430	<430	<430	<430	<430			N A
48.0 420 420 420 420 420 420 420 420 420 42				į	i		;		;		;	•	1				;	;
1,000 43	R2U	~ 520	~ 250	2 50	~ 250		2 50		<520		~520	~520	250	\$250 \$100 \$100 \$100 \$100 \$100 \$100 \$100 \$1	25			
456 456 456 456 456 456 456 456 456 456	R2C	908	800	800	900		800	~800			800	800	8	~800	908	•		
High	R2D	<750	<750	<750	<750		<750	430			<750	<750	<750	<750	<750		X X	Z
450 450	R3U	<410	<410	<410	<410		~410		<410		~ 410	<410	<410	<410	<410			Z.
1100 48.0 24.0 64.0	R3C	<5300	~ 5300	€3300	<5300	٧	5 300	•	<5300	٧	€5300	<5300	€5300	<5300	<5300			N
1100 460 1 cm 1	R3D	<470	<470	<470	<470		<470		~470		<47 0	<470	<470	<470	<470		Ϋ́	N A
14.0 1.0	R411	11000	480	1 24000	18000		13000		10000		11000	8500	9100	1600	-			Ž
1	R4C	<5200	<5200	<5200	<5200	٧	<5200	•	<5200	·	<5200	~5200	<5200	8300				X
430 430 430 430 430 430 430 430 430 430	R4C Duplicate	< 2400	<2400	<2400	<2400	Ī	<2400		<2400	-	<2400	<2400	<2400	2900	8800			Z
Hank C30 C50	R4D	<430	< 430	<430	<430		<430		< 430		<4 30	<430	<430	<430	<430		N.	N
Sign																		
(ug/l) iterial 410 420 430	4 OWS	€29	~590	~ 590	≪30		~ 590		~290		-590	€ 590	~ 590	690	-590			A A
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410 410 <td>R2C</td> <td>01></td> <td>97</td> <td>10</td> <td>~10</td> <td></td> <td>410</td> <td></td> <td>•10</td> <td></td> <td>•10</td> <td>~10</td> <td>~10</td> <td><10</td> <td>01∨</td> <td></td> <td><0.02</td> <td>Z</td>	R2C	01>	9 7	1 0	~10		410		•10		•10	~10	~10	<10	0 1∨		<0.02	Z
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bilicate <200 <200 <200 <200 <200 <200 <200 <20	R4C	410	6 10	9	10		10				~10	<10	₹10	1400	110			Z
; ; ; ; ; ; ; ;	R4C Duplicate	<200	<200	<200	€200		<200		€200	•	<200	<200	<200	800	200			NA
(lug/l) <10 <10 <10 <10 <10 <10 <10 <10 <10 <10	4 OWS	<10	~10	<10	۸10		~10		₹10		410	<10	~10	v10	410		<0.02	N
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	Method	4 10	410	<10	×10		410				₹10	<10	₹10	√10	410			₹

B = Analyte Was Not Detected Above Five Times The Value Reported In The Laboratory Blank. J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

NA = Analyte Was Not Analyzed.

e = Analyte Was Analyzed For But Not Detected Above The Reported Value.
 ND = Analytes Were Analyzed For But Not Detected.
 e = FAC 17-3 Water Quality Criteria For Class III Surface Waters.

Table 5-10

SUMMARY OF SEDIMENT AND

SURFACE WATER SAMPLE ANALYSES FOR METALS

FIRST STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
Sediment (ug/kg)								
R1U ()	NA	NA	NA	NA	8700 L	NA	NA	NA
R1C	1500 J	36200	530 J	7800 L	9200 L	130 J	160 J	<730
R1D	NA	NA	NA	NA	6600 L	NA	NA	NA
1 C.O.	NA	NA	NA	NA	8700 L	NA	NA	NA
1 M.O.	2200	2300 J	410 J	1300 L	4400 L	NA	<110	<550
R2U	NA	NA	NA	NA	5300 L	NA	NA	NA
R2C	630 J	16500 J	370 J	7500 L	5900 L	<130	<140	<730
R2D	NA	NA	NA	NA	8500 L	NA	NA	NA
R3U	NA	NA	NA .	NA	9400 L	NA	NA	NA
R3C	3300	50400	3600	71200 L	37400 L	<200	<210	<1100
R3D	NA	NA	NA	NA	5700 L	NA	NA	NA
R4U	NA	NA	NA	NA	364000 L	NA	NA ·	NA
R4C	490 J	22000 J	7400	80400 L	246000 L	<150	<170	<880
R4C Duplicate	480 J	29800	13200	119000 L	152000 L	<110	<120	<630
R4D	NA	NA	NA	NA	4700 L	NA	NA	NA
R4D Duplicate	NA	NA	NA	NA	5500 L	NA	NA	NA
4 OWS	NA .	NA	NA	NA	6000 L	NA	NA	NA
Background #	870	9100	< 220	4600	18600	< 100	170	< 930
Water (ug/l)								
* FL Criteria	50		0.8 - 1.2	50	30	0.2	25	.07
R1C	0.78 B	40 J	<1.7	3.4 J	4.2	0.68	<0.85	4.7 J
R2C	4.3 J	145 J	9.3	63.4	28.1	<0.15	<0.85	<4.4
R3C	<0.68	46.4 J	<1.7	<3.2	11	<0.15	<0.85	<4.4
R4C	<0.68	48.2 J	21.7	122	41.9	<0.15	<0.85	<4.4
R4C Duplicate	<0.68	22.6 J	12.8	58.9	41.1	<0.15	1.1 J	<4.4
4 OWS	<0.68	12.7 J	<1.7	<3.2	7.2	<0.15	<0.85	19.1
Blanks (ug/l)	<0.68							
Rinse	<0.68	1.6 J	<1.7	<3.2	6.9	0.6	<0.85	<4.4
Trip	<0.68	<0.9	<1.7	<3.2	4.5	<0.15	<0.85	<4.4

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

L = Analyte Was Present But The Reported Value May Be Biased Low; The Actual Value Is Expected To Be Higher.

B = Analyte Was Not Detected Above 5 Times The Value Reported In The Laboratory Blank.

NA = Analyte Was Not Analyzed.

< = Analyte Was Analyzed For But Not Detected Above The Reported Value.

^{# =} Background Sediment Sample Collected 11/28/89 During Step 2 SI.

^{* =} FAC 17-3 Water Quality Criteria For Class III Surface Waters.

Table 5-11 RESULTS OF SOIL ORGANIC VAPOR HEADSPACE ANALYSES (SECOND STEP OF THE SI) 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Location	Depth (ft)	OVA Reading with Filter (ppm)	OVA Reading without Filter (ppm)
WP 1-2	2.0 - 2.5	120	120
WP 2-7	4.0 - 4.5	110	50
WP 4-2	2.0 - 2.5	130	130

Table 5-12 SUMMARY OF GROUNDWATER SAMPLE ANALYSES FOR VOLATILES (ug/t) SECOND STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

			EPA	METHOD	601			ЕРА М	ETHO	0 602		
Location	Chloro- form		Dibromo chloro- methane	Total Trihalo- methanes	Chloro- ethane	1,1-Dichloro- ethane	Benzene T		Ethyl enzene	Total Xylenes	Tert-Butyl Methyl Ether	Total VOA
FL Criteria				100 I	3* 6300 A	0.3	B 1B	24 A	2 A	50 A		50 A
MW 1-1	<1	<1	<1	<1	< 1	<1	<1	<1	<1	<1	<1	<1
MW 1-2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
WP 2-12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
WP 2-13	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.2	<1	<1
MW 3E-1	<1	<1	<1	<1	2.8	3.7	31	8.1	26	110	<1	175
MW 3E-1 Duplicate	<1	<1	<1	<1	2.8	4.1	36	8.7	32	130	<1	207
MW 3E-2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
WP 3W-5A	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW 5-1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW 5-2	1.7	<1	<1	1.7	<1	<1	1.8	<1	<1	<1	<1	<1
MW A	<1	<1	<1	<1	<1	<1	<1	<1	36	29	<1	65
MW B	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW C	<1	<1	<1	<1	<1	<1	7.5	<1	<1	6.7	45	14.2
WP 7-2A	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
WP 7-5A	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW 8-1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW 8-1 Duplicate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW 8-2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW 8-3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
(Blanks ug/l)		,										
Decon Water - HH	12	4.3	1.1	17.4	<1	<1	<1	<1	<1	<1	<1	<1
Decon Water - CE	19	7.6	2.9	29.5	<1	<1	<1	<1	<1	<1	<1	<1
Bailer Blank 1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bailer Blank 2	<1	<1	<1	<1	<1	<1	<1	<1	<1	· < 1	<1	<1
Bailer Blank 3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Field Blank 1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Travel Blank 1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Travel Blank 2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

NA = Analyte Not Analyzed.

^{*} = Sum Of Total Trihalomethanes (Dichlorobromomethane, Dibromochloromethane, Bromoform, And Chloroform).

^{(1) =} Analysis By EPA Method 624.

A = FDER Guidance Concentration.

B = Florida Drinking Water Standard.

Total VOA Defined By FAC 17-770 As Total Of Benzene, Toluene, Xylene, And Ethyl Benzene.

HH = Hush House Near Site 4; Potable Water For Gross Decontamination.

CE = Civil Engineering Building; Potable Water For Gross Decontamination.

Table 5-13 SUMMARY OF GROUNDWATER SAMPLE ANALYSES FOR METALS, TDS, AND TOTAL HARDNESS (ug/l) SECOND STEP OF THE ŠI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	Cr	Pb	Fe	TDS	Total Hardness
FL Criteria	50 A	50 A	300 B	500,000 B	
MW 1-1	152	45.5	NA	NA	NA
MW 1-2	112	12 J	41,300	283,000	30,000
WP 2-12 Unfiltered	NA	5.9	NA	NA	NA
WP 2-12 Filtered	NA	2.8 J	NA	NA	NA
WP 2-13 Unfiltered	NA	5.6	NA	NA	NA
WP 2-13 Filtered	NA	1.5 J	NA	NA	NA
MW 3E-1	NA	NA	241,000	1,860,000	83,300
WP 3W-5A	NA	12.7	NA	NA	NA
MW 6-1	32.3	NA	NA	NA	NA
MW 6-2	128	NA	NA	NA	NA
WP 7-2A	NA	4.8 C	NA	NA	NA
WP 7-5A	NA	5.4 C	NA	NA	NA
(Blanks)					
Bailer Blank	< 5.5	< 0.92	NA	NA	NA
Decon Water - CE	< 5.5	3.8	NA	NA	NA
Decon Water - HH2	< 5.5	4.6 C	NA	NA	NA
Field Blank	< 5.5	< 0.92	NA	NA	NA
Fravel Blank	< 5.5	1.5 J	41.9 C	NA	NA
Method Blank	< 5.5	< 0.9	50.1	<1,000	<1,000
Method Blank 2		1.7			•

- NA = Analyte Was Not Analyzed.
- < = Analyte Was Analyzed For But Not Detected Above The Reported Value.</p>
- A = Florida Primary Drinking Water Standard.
- B = Florida Secondary Drinking Water Standard.
- C = Analyte Was Not Detected Above Five Times The Value Reported In The Laboratory Blank.
- J = Estimated Quantitation. Less Than Contract Required Detection Limit.
- HH = Hush House Near Site 4; Potable Water For Gross Decontamination.
- CE = Civil Engineering Building; Potable Water For Gross Decontamination.

Table 5-14
SUMMARY OF GROUNDWATER SAMPLE
ANALYSES FOR CHROMIUM (μg/l) AT SITE 6
125th FIGHTER INTERCEPTOR GROUP
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Location	Chromium (unfiltered)	Chromium (filtered)		
Florida Criteria	50	50		
MW 6-1	9.9 B U	<3.3 U		
MW 6-1 Duplicate	N/A	<3.3 U		
MW 6-2	19.6 U	<3.3 U		
WP 6-4	286	<3.3 U		
WP 6-5	32.6 U	<3.3 U		
WP 6-6	1,650	<3.3 U		
Equipment Blank	10.4	N/A		
Field Blank	7.2 B	N/A		
Method Blanks	3.3 U	N/A		

B = Reported value obtained is less than the contract required detection limit, but greater than or equal to the instrument detection limit.

U = Reported value obtained is greater than the instrument detection limit, but less than five times the amount reported in the equipment blank.

N/A = Analyte was not analyzed.

Table 5-15 SUMMARY OF SOIL SAMPLE ANALYSES FOR

METALS (ug/kg)

SECOND STEP OF THE SI 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD

JACKSONVILLE, FLORIDA

Location	Depth (ft)	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
MW 8-1	1.0-3.0	NA	9500	NA	4500	4600	NA	NA	NA
MW 8-1 Duplicate	1.0-3.0	NA	11200	NA	5300	4200	NA	NA	NA
MW 8-1	3.0-5.0	NA	17500	NA	4800	3500	NA	NA	NA
MW 8-2	1.0-3.0	NA	19400	NA	5100	4800	NA	NA	NA
MW 8-2	3.0-5.0	NA	22000	NA	6400	3700	NA	NA	NA
MW 8-3	1.0-3.0	NA	14200	NA	6000	4500	NA	NA	NA
MW 8-3	3.0-5.0	NA	14900	NA	3500	2600	NA	NA	NA
SB 8-5	1.0-3.0	NA	8300 J	NA	2500	3100	NA	NA	NA
SB 8-5	3.0-5.0	NA	22400	NA	6500	3700	NA	NA	NA
Background	1.0-2.0	140 J	3100 J	< 190	1800	3400	< 86	< 130	< 800

NA = Analyte Was Not Analyzed.

<= Analyte Was Analyzed For But Not Detected Above The Reported Value.

J = Estimated Quantitation. Less Than Contract Required Detection Limit.

Table 5-16

SUMMARY OF SEDIMENT AND SURFACE WATER SAMPLE ANALYSES FOR METALS

SECOND STEP OF THE SI

125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Location	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
Sediment (ug/kg)								
DG 1	500 J	34800	< 220	4500	6100	< 98	< 150	< 930
DG 2	440 J	19100	280 J	6000	6200	< 100	< 150	< 940
Background	870 J	9100 J	< 220	4600	18600	< 100	170 J	< 930
Water (ug/l)								
* Fl Criteria	50		0.8 - 1.2	50	30	0.2	25	.07
DG 1	< 0.34	32.8 J	< 1.6	< 5.5	< 0.92	< 0.15	< 1.1	< 6.7
DG 2	1.4 J	40.3 J	< 1.6	< 5.5	2.5 B	0.35	< 1.1	< 6.7

Notes:

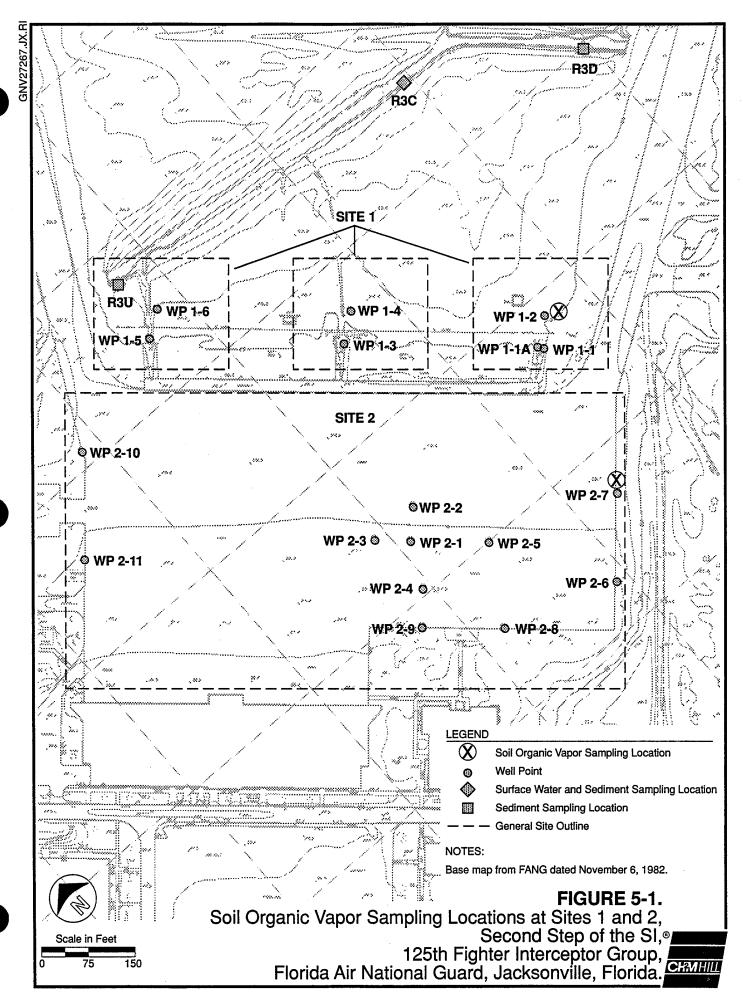
N/A = Analyte Was Not Analyzed.

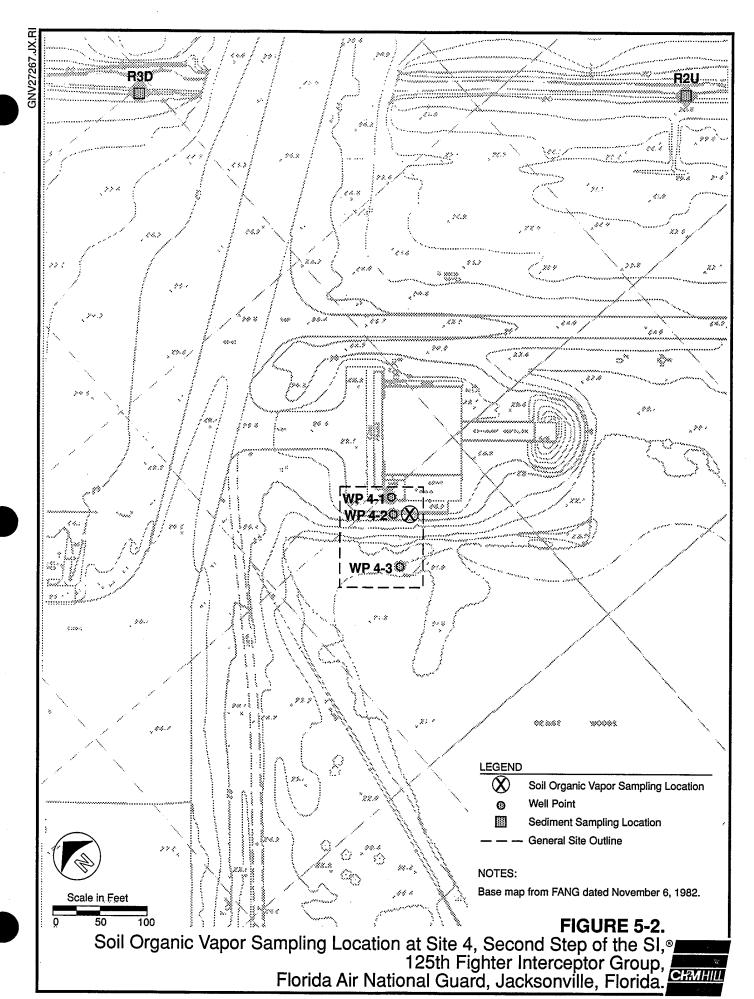
< = Analyte Was Analyzed For But Not Detected Above The Reported Value.</p>

^{* =} FAC 17-3 Water Quality Criteria For Class III Surface Waters.

J = Estimated Quantitation. Less Than Contract Required Detection Limit.

B = Analyte Was Not Detected Above Five Times The Value Reported In The Laboratory Blank.





SECTION 6
Preliminary Risk Assessment

6. PRELIMINARY RISK ASSESSMENT

Preliminary assessment of the risks to public health and the environment posed by the types and levels of contaminants reported at the eight sites at FANG includes the following components:

- Identification of the existing and potential routes by which receptors may be exposed to contaminants (exposure assessment)
- Definition of human health and environmental criteria (toxicity assessment)
- Characterization of cumulative risks to the affected population or environment from the site contaminants (risk characterization)

The Airport Master Plan⁹ for Jacksonville International Airport addresses concerns for compatible land use surrounding the airport. Airport property boundaries extend over approximately 4,000 acres, and wetland areas have been identified in much of the adjacent property, which will further slow development in those areas. FANG property is leased until the year 2035 from the Jacksonville International Airport so future residential development would not be expected to occur on the property in the near future.

6.1 CONTAMINANT DATA EVALUATION

Data summaries were prepared using data obtained through December 1989, as shown in Tables 6-1, 6-2, and 6-3, to identify the concentration and detection frequency of contaminants at the eight sites and in the onsite and downstream drainageways. Table 6-4 summarizes the contaminants by the media in which they were found. In Table 6-2, contaminant concentrations for Site 8 are separated out from the other sites, because of the generally higher levels of metals reported there. Table 6-3 separates surface water and sediment samples collected from Reaches 1 through 4 in the first step of the SI from those collected at downstream drainageway locations in the second step of the SI.

Qualifiers are added during the data validation process to suggest potential precautions in the use of the data. Estimated concentrations (denoted with a J) are retained for use in the preliminary risk assessment because the contaminant is known to be present, even though there is uncertainty about the precise concentration.

The data are discussed to identify potential biases that would affect the risk characterization. Constituents are identified that do not appear to originate at the sites under evaluation and are not, therefore, included in the preliminary risk assessment.

Silver, phenol, chloroform, and EDB were reported in a single surface water sample from the drainageways but were not detected in soil or groundwater samples from the eight sites or in sediment samples. These compounds will not be evaluated.

Tert butyl methyl ether was reported in one surface water sample and one groundwater sample from a monitor well installed by others at Site 5.

Several polynuclear aromatic hydrocarbon constituents were identified in one of the sediment samples but were not reported in soil, groundwater, or surface water samples. Because they do not appear to have originated from the sites, these constituents will not be addressed in the preliminary risk assessment. Similarly, bromomethane was detected only in two sediment samples and does not appear related to site activities, so it will not be addressed.

Trichlorofluoromethane was reported in four sediment samples. Although this compound was not reported in groundwater or soils at the sites, it may have been used in the FTAs and carried to sediments by runoff and will be addressed in the preliminary risk assessment.

The metals reported above background concentrations in sediment, soil, ground-water, and surface water samples will be included in the preliminary risk assessment. However, the high suspended solids levels found in the unfiltered groundwater samples could cause the metal results to be biased high, which would

affect their interpretation for assessing risk. A properly developed water supply well would not contain the level of particulates found in the well points. Migration of silt-size particles would also be slow.

Bis(2-ethyl-hexyl)phthalate was reported in groundwater samples at concentrations similar to those reported in the blanks. The compound was not detected in onsite soils but was reported in several sediment samples at concentrations near the detection limit. Detection limits were elevated for the two samples with the highest concentrations; the duplicate sample for one of these was below detection limits. Because phthalates are not likely to be associated with the potential contamination sources at FANG but are common laboratory contaminants, bis(2-ethyl-hexyl)phthalate will not be further evaluated in this assessment.

Methylene chloride was reported for only one of the 56 groundwater samples and only for EPA Method 624. Because the detected concentration is probably a result of laboratory contamination, the compound will not be further assessed.

The following contaminants were retained for evaluation in the preliminary risk assessment:

- Metals: Arsenic, barium, cadmium, chromium, lead, mercury, selenium
- Total volatile organic aromatics (as defined by FAC Chapter 17-70): Benzene, toluene, ethyl benzene, xylenes
- Chlorinated hydrocarbons: Chloroethane, chloromethane, 1,1dichloroethane, 1,1,1-trichloroethane, vinyl chloride,
 t-1,2-dichloroethene, chlorobenzene, dichlorobenzenes, trichlorofluoromethane
- Semivolatile organics: Naphthalene, benzoic acid, 4-methyl phenol

6.2 CONTAMINANT FATE AND TRANSPORT

The environmental fate and transport of contaminants at FANG are important factors in determining the potential for migration through and from the site and in assessing the potential for exposure. Environmental fate and transport depend on the physical and chemical properties of the contaminants, the environmental transformation processes affecting them, and the media through which they migrate.

Contaminants may migrate from the eight sites through groundwater flow or surface water runoff. The dense, fine grained soils limit permeability. The wells in the eastern portion of the site were bailed dry and sampled the following day, which suggests the shallow soils have relatively low permeability. This characteristic reduces the rate of infiltration of wastes and reduces the rate of leaching of contaminants during rainfall events.

In the eastern portion of FANG, the hydraulic conductivity of the surficial aquifer ranges from 1 to 2 ft/day and the groundwater velocity from 0.0025 to 0.125 ft/day. Hydraulic conductivity is approximately 5 ft/day in the western portion of FANG and groundwater velocity ranges from 0.0125 to 1.25 ft/day. Because the gradients are shallow, the average linear groundwater flow velocity at FANG was estimated to range from 0.0025 to 1.25 ft/day. A slow groundwater velocity reduces the rate of migration of contaminants within the groundwater as well as the rate of discharge to the drainageways.

Water levels in the Floridan aquifer in this area are greater than water levels in the surficial aquifer. This creates an upward hydraulic gradient that prevents contaminant migration from the surficial aquifer to the deeper Floridan aquifer, which is commonly used as a source of drinking water in the region. The Hawthorn Formation, which lies between the surficial and Floridan aquifers in the region, acts as a confining unit and would further impede groundwater flow between the two aquifers.

Flow of groundwater and contamination under natural conditions in the surficial aquifer tends to be lateral, toward surface drainage features such as the

drainageways at FANG. However, if groundwater is pumped from the Floridan aquifer at a sufficiently high rate to lower the potentiometric surface below the level of the surficial aquifer, downward flow of groundwater from the surficial aquifer to the Floridan aquifer could be induced. Using conservative assumptions, a dilution ratio of 1 to 250 was estimated for contaminant transport from the surficial aquifer to the Floridan aquifer. A much greater dilution would actually be expected, as this estimate does not account for chemical transformations or degradation of contaminants as they flow through about 400 feet of Hawthorn strata. Even if a downward gradient were induced by pumping of the Floridan aquifer, transport of groundwater and contaminants through the Hawthorn Formation would be unlikely in this area because of the thickness and lithology of the formation in the region.

6.2.1 Organic Contaminants

A summary of the physical and chemical properties of the organic chemicals of concern at FANG is presented in Table 6-5. Key parameters affecting contaminant migration are volatility and water solubility. Highly soluble chemicals can be rapidly leached from wastes and soils and are generally more mobile in groundwater. Volatile constituents are removed more rapidly from surface water or soil.

The octanol-water partition coefficient (K_{ow}) is often used to estimate the extent to which a chemical will partition from water into lipophilic parts of organisms (e.g., animal fat) and is correlated with partitioning to soil organic carbon (K_{oc}) , solubility, and the bioconcentration factor (BCF). It is a commonly available parameter used to estimate related properties when measured values are not readily available. BCF is defined as the concentration of a chemical at equilibrium in an organism (wet weight) divided by the mean concentration in water. Values of BCF range from about 1 to over 1,000,000.

The organic carbon partition coefficient (K_{oc}) reflects the tendency of a compound to sorb to organic matter in soil. Higher sorption generally reflects lower solubility and therefore slower migration in groundwater. The contaminant velocity relative

to groundwater movement (V_w/V_c) is defined by a retardation factor that is calculated as follows:

$$Rd = V_w/V_c = 1 + (B K_{oc} f_{oc})/P_t$$

where:

 V_w = Velocity of groundwater

 V_c = Velocity of contaminant

Rd = Retardation factor

 K_{oc} = Partition coefficient for organic carbon

 f_{oc} = Fraction of organic carbon in the soil

B = Bulk density

 P_t = Total porosity

The organic carbon content of the soils measured at FANG ranges from 0.2 to 1 percent. Typically, B/P_t ranges from 4 to 10. Estimated retardation for constituents in Table 6-5, assuming B/P_t is 4, ranges from 1.01 for vinyl chloride at a low f_{oc} to over 4,000 for naphthalene at a f_{oc} of 0.01. Most constituents reported at these sites would migrate 10 to 250 times slower than the groundwater.

The degree of volatilization of contaminants depends on vapor pressure, water solubility, and diffusion coefficients. Vapor pressure is the relative measure of the volatility of chemicals in their pure state. Highly water soluble compounds generally have lower volatilization rates from water unless they also have high vapor pressures. The Henry's Law constant combines vapor pressure with solubility for estimating releases from water to air. Compounds with Henry's Law constants greater than 10⁻³ atm-m³/mole can be expected to readily volatilize from water.

Several volatile organic constituents with relatively high aqueous solubilities, including the aromatics common in fuels and chlorinated solvents, were reported in groundwater samples from the eight sites. The volatile constituents would be slow to volatilize from subsurface soils and groundwater but would readily volatilize upon discharge to the drainageways. The chlorinated solvents have

relatively high mobility and degrade most readily under anaerobic conditions, which are likely at the sites where OVA readings indicated methane gas was present. The presence of a number of anaerobic biodegradation products of common solvents (e.g., vinyl chloride, 1,1-dichloroethane, chloroethane, and t-1,2-dichloroethene) suggests this process is occurring at FANG. Conversely, volatiles degrade most readily under aerobic conditions and will be more resistant to degradation in the anaerobic groundwater system.

The relatively low concentrations of contaminants detected in groundwater samples from the sites, as compared to their solubility, suggest there is no floating hydrocarbon plume, although the highest contaminant concentrations and most frequently detected constituents were fuel components. This is consistent with the absence of any measurable depths of floating hydrocarbons in the wells and well points installed during the SI.

6.2.2 Inorganic Contaminants

Inorganic constituents may also migrate with groundwater or be carried with particulates into the drainageways. The mobility of metals depends on a number of factors, including oxidation state, dissolved organic constituents, and pH. Inorganic constituents detected at the sites in excess of drinking water standards include chromium and lead. Mercury concentrations in downstream drainageway samples exceeded water quality criteria. The form of these constituents affects both mobility and toxicity.

Lead is considered to have low mobility, particularly under reducing conditions where it would precipitate as lead sulfide.

Chromium can exist in aqueous solution as the trivalent cation Cr III or as an anion, where the oxidation state is Cr VI (hexavalent). In rock minerals, the predominant oxidation state is Cr III. The reduced form (Cr III) is less soluble and less mobile than the oxidized form. Migration of cations may be further retarded by cation exchange processes in the soils.

Hexavalent chromium is more toxic and mobile, so it presents a greater risk. Hexavalent chromium is readily reduced to the trivalent form in the presence of reduced iron (ferrous ion) but is not reoxidized easily. Under the reducing conditions present at FANG, as suggested by the methane, breakdown products of chlorinated solvents, and high iron concentrations indicative of ferrous ions, chromium would likely be reduced to the trivalent form.

Mercury may exist in inorganic or organic (alkyl) forms. Organic forms (e.g., methyl mercury) produced by methylation under reducing conditions are more readily absorbed.

Organomercuric compounds were widely used as biocides in paints, for treatment of seed grain, and in other applications until they were banned in the 1960s. Although mercury is rarely found in its naturally occurring elemental form, its tendency to volatilize can lead to wide dispersion. Elevated levels of mercury have been reported in numerous locations in Florida without a known source. A task force to investigate the high levels of mercury reported throughout Florida was recently established by Governor Bob Martinez. The source of the mercury problem seems to be associated with peat, particularly in areas of low pH waters and swamps. The reason for the elevated levels is unclear, but it may be related to the absorption of mercury to peat and the potential release of naturally occurring mercury following development of areas with peat soils.

The major removal mechanism for mercury from natural water systems is adsorption onto particulates and subsequent settling. The high organic content of the sediments favors the microbial methylation of mercury. Methyl mercury is the form most readily accumulated and retained in aquatic biota.

6.2.3 Impact of Site Contamination on Drainageways

A point source of contamination discharging to a surface water body would be diluted by the surface water flow. Additional reductions in concentration would occur for many constituents as a result of processes like volatilization, biodegradation, or photolysis. Similarly, contaminants in soils would not increase in concentration upon discharge to the surface water body.

Comparison of site soil and groundwater concentrations to the sediment and surface water concentrations, as shown in Figures 6-1 and 6-2, suggests multiple sources may impact the drainageways. Several parameters were reported only in surface water, as shown in Table 6-4. Five of the seven metals in sediments exceeded concentrations shown in soils from the eight sites. Cadmium concentrations in both sediment and surface water samples significantly exceeded maximum site concentrations. The maximum reported groundwater concentration of lead (1,200J µg/l) was higher than concentrations reported in surface water, but this level has been attributed mainly to particulates in well point samples. These concentrations would not represent anticipated exposure concentrations in a properly developed supply well. Concentrations were significantly reduced in monitor well and filtered well point samples.

In addition, several volatiles typical of fuels were reported in one of the surface water samples at concentrations that were more than an order of magnitude higher than those observed at the sites. Benzene, which would be expected to readily volatilize from surface water, was reported at 470 µg/l. The presence of the fuel components may reflect transient releases to the drainageway from ongoing site activities.

Although some contaminant concentrations in samples obtained from the sites exceed those reported in surface water samples from the drainageways, the rate of discharge of groundwater to the drainageways is expected to be slow, with considerable dilution from other runoff and groundwater discharges. Therefore, based on current groundwater concentrations, surface water concentrations would not be expected to exceed criteria. In addition, downstream samples at DG-1 and DG-2 show significant decreases in sediment and surface water contaminant concentrations, suggesting that significant dilution will reduce surface water concentrations at downstream exposure points.

6.3 EXPOSURE PATHWAY ASSESSMENT

The potential for exposure of human or environmental populations to contaminants at or originating from the eight disposal/spill sites at FANG is evaluated by an exposure pathway assessment. In identifying potential exposure

pathways, both current and possible future uses of the sites and surrounding areas were considered. A complete exposure pathway includes a contaminant source, a mechanism for contaminant release, an environmental transport medium, an exposure point (receptor location), and a route of exposure. Exposure may occur when contaminants migrate from the site to an exposure point or when a receptor comes into direct contact with waste or contaminated media at the site. An exposure pathway is complete if the receptor can take in contaminants through ingestion, inhalation, or dermal absorption of contaminated media or waste. Potential exposure pathways at FANG are summarized in Table 6-6.

Figure 6-3 illustrates physical features on the FANG property; the approximate locations where the photographs in Figure 6-3 were taken are shown in Figure 6-4. The nearest residences to FANG are located approximately 0.75 mile to the west, and access to the installation is restricted. The surrounding property is, and is expected to continue to be, owned by the Jacksonville International Airport, which has removed houses on property it has purchased in the vicinity of the airport. As a result, the potential future use of the FANG property and surrounding areas will probably not be residential. Reasonable maximum onsite exposures are based on use of these areas by site workers. It is assumed a maximum exposure duration for civilian base personnel is 40 years.

The following discussion presents exposure assumptions for each of the media of potential concern. Calculated intakes are summarized in Section 6.5.

6.3.1 Air

The air pathway was not retained for evaluation in the risk assessment. Concentrations of volatile constituents at the sites were low and would make a negligible contribution to overall emissions from FANG. Dust would be minimized by the paving and vegetative ground cover.

6.3.2 Soils

Contaminants were reported in some sediment and surficial soil samples at concentrations above background. Under current land use conditions, primary receptors are onsite workers who may occasionally be in these areas. Construction activities may increase worker exposures. There are no adjacent or onsite residential areas. Trespassers, including children, are not likely to gain access to the property, because access is restricted by fences and guards at the entrances. Worker exposures to site soils will be reduced by vegetative covers or paving and infrequent activity in these areas.

Under the assumption that routine maintenance may occur in these areas, it is possible that base personnel may be exposed through incidental ingestion or dermal absorption from surface soils. Input parameters for ingestion exposures assume an ingestion rate of 10 mg/event, which is one-tenth of the daily ingestion rate reported by the EPA for adults.¹⁰ This value is used because exposures are expected to be brief. Additional assumptions include an exposure frequency of 12 events/year (once per month) for 40 years for a 70-kilogram adult worker.

Dermal absorption is a complex process and there is considerable uncertainty associated with estimating its magnitude. Skin is not highly permeable, although some chemicals (typically organic compounds) can be absorbed in sufficient quantities to produce systemic effects. For this evaluation, dermal absorption from soil is a function of the concentration of contaminants in the soil, the amount of soil in contact with the skin, the duration and frequency of the contact, and the type of contaminant. Regional default values for absorption factors from soil (EPA Region IV, personal communication, April 1990) are 1 percent for metals and 10 percent for organic compounds. The exposed skin area is assumed to be 2,940 cm²/day for an individual wearing a short-sleeved, open-necked shirt; pants; shoes; and no gloves or hat.¹¹ As with ingestion, it is assumed the receptor is a 70-kilogram adult worker exposed 12 days/year for 40 years.

6.3.3 Sediment

Under current land use, direct human exposure to contaminated sediments underlying onsite surface waters is unlikely. Primary risks from sediment contamination, which will be qualitatively assessed, would be to the surface water ecosystem and humans as a result of toxicity or bioaccumulation and biomagnification through the food chain.

6.3.4 Surface Water

Stormwater runoff and groundwater at FANG discharge to several surface drainageways, where selected constituents were intermittently detected. These drainageways also receive some discharges from the airport. Regional surface water drainage, which may intercept a significant portion of the shallow groundwater flow, is generally from west to east. The drainageway network flows east into a swampy area that appears to be drained by Cedar Creek. Transport of sediment in the drainageways is believed to be limited by low hydraulic gradients and the thick vegetation found throughout much of the drainageway network.

No public access is permitted to the onsite surface waters. Drainageway flow depends on rainfall events. Considerable vegetation grows on the banks of the drainageway north of FANG, making it unlikely to be used for recreation. Contaminants in surface water could result in exposure of aquatic organisms in the drainageways or downstream.

Potential human exposures may occur from consumption of fish or recreational use of Cedar Creek. Exposure of aquatic organisms or people who consume fish will be evaluated based on available water quality criteria. Surface waters at and surrounding FANG are not used as a drinking water supply. Recreational use exposures may include incidental ingestion or dermal exposures. These exposures will not be quantified, as the primary site-related constituents are below drinking water standards in the downstream samples and recreational uses would result in substantially lower exposures than from drinking the water.

6.3.5 Groundwater

Contaminants were reported in several monitor wells at concentrations above drinking water standards. Under current land use conditions, no exposure pathways are associated with shallow groundwater use. Shallow groundwater at FANG is not used for either domestic or agricultural purposes. Deep wells used for irrigation or potable water supply for the airport have been identified in areas with upward vertical groundwater gradients. Shallow groundwater from the site appears to discharge to the drainage ditches.

A request was made to the St. Johns River Water Management District for information on all wells and consumptive use permits on record for an area surrounding FANG and defined by Sections 17, 20, 21, 22, 27, 28, 29, 37, and 39 within Township 1 North and Range 26 East. No wells within 1 mile of FANG were found in district records.

On June 23, 1989, a visit was made to the City of Jacksonville Department of Bio-Environmental Services (JBES) to review records of wells in the FANG area. Eight water wells within approximately 1 mile of FANG were found in JBES files; available information is summarized in Table 6-7. The records listed four fire protection wells at the Jacksonville International Airport, two irrigation wells, and two wells with no specific usage.

Several private houses were previously located near FANG, according to FANG personnel and data on a U.S. Geological Survey (USGS) topographic map. Some of the wells listed by JBES may have been located at these houses, which were removed when the property was purchased by the Jacksonville International Airport. JBES also had records of five monitor wells within 1 mile of FANG: three in the FANG Vehicle Maintenance Compound and two used as UST compliance wells at the airport off Pecan Park Road.

The approximate locations of the water wells found in JBES records are shown in Figure 6-5. The "flowing well" shown in Figure 6-5 north of FANG was on the original USGS base map and has been abandoned, according to FANG personnel.

Three additional wells were identified by CH2M HILL within a 1-mile radius and are listed in Table 6-7. An old water supply well near the fire station at FANG is maintained for cooling water supply only, according to FANG personnel, and no data on depth or geology were available. Information from engineering staff at the Jacksonville International Airport indicates there are two wells on airport property currently used for potable water supply. The wells were both installed in 1967 and are each 1,200 feet deep. No other information was available on these wells, which supply drinking water for the airport and FANG.

The surficial groundwater flow directions at FANG are complex and variable and appear to be controlled by topography and surface drainage features. The hydrogeologic assessment indicates that the regional water table is relatively flat and that shallow groundwater flows in many directions locally. Water table elevations appear to be generally higher on the western sites, and on a regional scale, shallow groundwater may flow from west to east.

From the well inventory, it appears that shallow groundwater is not used in the area for potable supply. Deeper groundwater is used for potable supply at the airport, but available information suggests that contaminated shallow groundwater is not likely to migrate to that depth. Available literature suggests that the potentiometric surface of the Floridan aquifer exceeds the elevation of the water table, indicating a potential for upward groundwater flow. Several semi-confined units within the surficial aquifer were also indicated by cone penetrometer data.

Available information indicates no current pathway for exposures to shallow groundwater. Iron, TDS, and hardness were analyzed in two monitor wells for information on overall water quality in the shallow zone. Iron concentrations were above the secondary drinking water standard of 0.3 mg/l in both samples and TDS exceeded the 500 mg/l secondary standard in one sample. This suggests the general quality of shallow groundwater may not be desirable for drinking water supply. Future potable use of groundwater from the unconfined surficial aquifer is unlikely because of the undesirable water quality and the poor yield from the shallow aquifer.

A reasonable, maximum exposure, future use scenario assumes a well is placed in the deeper aquifer in the vicinity at the site to provide a potable water supply for onsite workers. A well placed in this zone would induce downward migration of the surficial contaminants. Attenuation of these constituents at the receptor location is estimated to be greater than 250 to 1, as discussed in Section 6.2. Ingestion rates of 1 liter/day are assumed for each working day (5 days/week, 48 weeks/year, 40 years) for a 70-kilogram adult worker.

6.3.6 Environmental Exposures

The setting around the eight sites at FANG is mainly an urbanized area that extends northeast across the Jacksonville International Airport and includes buildings, paved areas (roads and runways), and mowed grass cover. A forested area is located approximately 1,000 feet to the south of FANG. Drainageway surface waters discharge to a wetland southeast of FANG. Another wetland northwest of FANG could be affected by shallow groundwater flows from Site 6.

Environmental exposures may result from direct contact or ingestion exposures as a result of contact with soils, sediments, surface water, or biota.

6.4 TOXICITY ASSESSMENT

The toxicity assessment addresses both the carcinogenic and non-carcinogenic health effects of the contaminants. The EPA currently considers that there is no threshold of carcinogenicity (i.e., no level of exposure to a carcinogen that will not result in some finite possibility of causing the disease). There is a threshold of exposure related to non-carcinogens.

Five of the contaminants under consideration are classified as known or probable human carcinogens by the EPA Carcinogen Assessment Group. The carcinogen classifications are based on both animal and human studies and employ a weight-of-evidence approach because toxicological and epidemiological studies show such variation in quality and consistency. The following classifications are used:

A: Human carcinogen

- B1: Probable human carcinogen, limited human evidence
- B2: Probable human carcinogen, sufficient evidence in animals, inadequate or no evidence in humans
- C: Possible human carcinogen
- D: Not classified as to human carcinogenicity

Non-carcinogenic health effects include a variety of toxic effects on organ systems and on developing fetuses. Constituents considered to be potential carcinogens are also capable of causing non-carcinogenic effects.

Toxicity depends on the dose of the substance. Critical toxicity values are a quantitative expression of the dose-response relationship for a chemical, which is the quantitative relationship between the dose of a chemical and the effect it causes. Critical toxicity values include cancer potency factors or reference doses (RfDs) specific to the exposure routes. The toxicity values used for FANG were obtained from EPA's Integrated Risk Information System (IRIS) data base for 1990. The RfDs and cancer potency factors used in this assessment are summarized in Table 6-8. Toxicological profiles of selected constituents reported at the sites are presented in Table 6-9.

6.5 RISK CHARACTERIZATION

6.5.1 Methodology

The approach used for estimating human health risks is summarized in Appendix G. Non-carcinogenic effects were assessed by comparison of the estimated daily intake of a contaminant to its RfD. For multiple chemicals, a "Hazard Index" approach that assumes dose additivity was used. If the Hazard Index is greater than 1, there may be a concern for a potential non-carcinogenic health risk.

The potential for carcinogenic effects associated with a given exposure was evaluated by estimating excess lifetime cancer risk, or the incremental increase in the probability of developing cancer over the background probability. For example, a 10⁻⁶ excess lifetime cancer risk means that for every 1 million people exposed to the carcinogen throughout their lifetimes, the average incidence of cancer is increased by one extra case. Because of the methods followed, excess lifetime cancer risks should be regarded as upperbound estimates. The methodology calculates the upperbound of the 95th percentile confidence limit as the slope of the dose response curve and, therefore, should be considered an upperbound; the lower bound could be zero. While synergistic or antagonistic interactions might occur, carcinogenic risks within a route of exposure are treated as additive.

EPA is currently reevaluating the carcinogenic potency of arsenic and has recently adjusted its estimate of cancer potency for arsenic from 15 to 1.5 mg/kg/day. The agency is also considering other issues associated with arsenic, including the appropriateness of the current MCL of 50 μ g/l, the role of arsenic as an essential nutrient, and the treatability of arsenic-induced skin cancer.

No toxicological values (cancer potency factors or RfDs) are available from EPA concerning lead. EPA has proposed lowering the MCL to $10~\mu g/l$ at the tap and $5~\mu g/l$ at the treatment plant. The Hazard Index values calculated for FANG do not include risk from lead exposure because of the lack of toxicological assessment values.

6.5.2 Soils

With the exception of xylene in a single sample, organic constituents were not reported in surface soils. Maximum soil concentrations were evaluated for incidental ingestion or dermal absorption by onsite workers to evaluate the need for potential restrictions on land use to protect human health. The non-carcinogenic risks are shown in Tables 6-10 and 6-11. The Hazard Index was less than 1 for these exposures, suggesting non-carcinogenic risks from the eight sites are not a concern.

The RfD for lead is currently being reevaluated by EPA. An interim soil cleanup level for total lead has been set by the Office of Emergency and Remedial Response and the Office of Waste Programs Enforcement at 500 to 1,000 mg/kg, which is considered protective for direct contact at residential settings. The highest lead concentration reported in site soils was 1.2 mg/kg.

Arsenic was the only carcinogenic soil constituent by ingestion reported in onsite soils. The excess lifetime risk for arsenic, as shown in Tables 6-12 and 6-13, is 5×10^{-9} for incidental ingestion and 2×10^{-8} for dermal absorption. These are based on the maximum site-wide arsenic concentration of 1,200K µg/kg. Detected concentrations in soils were as low as 180 µg/kg and averaged about 620 µg/kg.

6.5.3 Surface Water and Sediments

Direct contact with contaminated sediments is not a primary human exposure pathway. Drainageway surface waters would not be suitable for recreational swimming and water sports because the water is shallow and mixed with vegetation.

Cedar Creek is a potential offsite exposure point, but contaminant concentrations in surface water decreased substantially at the downstream sampling locations. Additional reductions would occur before migration offsite of the airport property boundary to public access areas. Potential impacts on aquatic life are discussed in Section 6.6. Table 6-14 compares groundwater and surface water concentrations with the Federal Ambient Water Quality Criteria (FAWQC) for protection of human health from consumption of fish.

No FAWQC for organic constituents were exceeded in downstream sample locations. The criterion for benzene was exceeded in a single groundwater and surface water sample onsite, but the high volatility of this compound would rapidly reduce its concentration in downstream locations.

Arsenic and mercury criteria were exceeded in downstream locations. The criteria for these constituents are low (below detection limits). These constituents appear

to be generally present in this area at low concentrations and do not appear to result from activities at any of the eight sites.

6.5.4 Groundwater

The shallow aquifer from which groundwater samples were collected is not used for water supply and, based on the hydrogeologic assessment, is not likely to be exploited as a source of water supply.

Table 6-15 summarizes the non-carcinogenic risks associated with ingestion of groundwater from the lower potable aquifer based on the maximum estimated groundwater concentration for all the sites with the 250- to -1 dilution. The daily intakes for non-carcinogenic constituents besides lead and arsenic do not exceed the associated RfD for the contaminants reported in groundwater; this suggests that the non-carcinogenic risks for individual constituents are not a concern. The Hazard Index for estimated maximum concentrations throughout FANG is also less than 1.

The Hazard Index calculations do not include lead and arsenic. Current drinking water standards for lead (50 μ g/l) were exceeded at Sites 1 and 2 in well point samples collected during the first step of the SI, but concentrations from monitor well samples were below the standard. The proposed standard (5 μ g/l) was exceeded at all sites except Site 5. Lead was present in all groundwater samples and proposed criteria were exceeded in several, but a definable plume of lead is not apparent. Because lead occurs naturally and is generally strongly sorbed, the concentrations may be attributable to silt and particulates, particularly in well point samples. Arsenic was not reported above the MCL.

The primary carcinogenic risks associated with the eight sites are from arsenic and benzene. Arsenic was not, however, reported above drinking water standards in any of the groundwater samples and appears to be ubiquitous at FANG, as it was detected in all soil and sediment samples (including background) and two-thirds of the surface water and groundwater samples. The maximum groundwater concentration of arsenic was 9.2 μ g/l, as compared to the drinking water standard of 50 μ g/l.

Organic constituents will continue to degrade and would not be present at current concentrations over a lifetime of exposure. Many of the organic constituents were detected in fewer than 10 percent of the samples analyzed and, although intermittently detected, do not appear to represent a definable plume.

Excess lifetime cancer risks associated with potential future ingestion of groundwater from the lower aquifer are summarized by site in Table 6-16. Excess lifetime cancer risks range from 3×10^{-9} at Site 2 to 3×10^{-7} at Site 1. Carcinogenic risks are primarily attributed to arsenic and benzene.

6.5.5 Summary

Current risks to human health from the eight sites are low because of low exposures. No drinking water pathway is present, and there are no nearby residences to potentially increase direct exposures. The primary pathway for exposure is potential ingestion of contaminated fish, but fishing would be expected to occur at downstream locations where contaminant concentrations are lower than in the drainageways at FANG. In addition, multiple sources at both FANG and Jacksonville International Airport appear to contribute to the elevated metals in the drainageways, and it is not clear that the current concentrations in surface water are a result of migration from the eight sites.

The Airport Master Plan⁹ and Airport Noise Control Land Use Compatibility Studies¹² support a long-term commitment to restrictions on residential land use in this area. The current lease held by FANG extends for 45 years, to the year 2035. Soil samples do not exceed acceptable levels for incidental ingestion or dermal absorption exposures that may occur for workers. Non-carcinogenic risks are not exceeded for use of the lower aquifer as a drinking water supply. The highest excess lifetime cancer risk was 3 x 10⁻⁷ at Site 1 based on conservative assumptions regarding potential future use of a potable water well completed in the deep aquifer in this area.

6.5.6 Uncertainties in Risk Estimation

This section discusses the key assumptions and uncertainties that affect the level of confidence placed on risk estimates for this site. Because uncertainties are inherent to any risk assessment, a qualitative discussion of these uncertainties provides perspective on the risks calculated for a site. These uncertainties are generally associated with the following factors:

- Selection of chemicals
- Likelihood of exposure pathways and land uses actually occurring
- Methods for calculating exposure concentrations
- Parameters and assumptions used to estimate exposures
- Selection of cancer slope factors and RfDs
- Significant data gaps

The process of selecting contaminants of potential concern for FANG eliminated laboratory contaminants and constituents that are not site related. The data review suggests that some constituents may show elevated groundwater concentrations as a result of the presence of particulates, which would tend to overestimate risks.

Workers may occasionally enter the areas encompassed by the sites. Maximum soil concentrations were used to estimate potential incidental ingestion or dermal absorption risks associated with contact with soil, although some of the samples were subsurface and contact would only occur if activities disturbed the soil. This assumption would, therefore, tend to overestimate risks associated with the sites. Maintenance activities in the area are expected to be intermittent as estimated, but the dose per event may be higher (e.g., 100 mg/day) depending on the activity. If the dose were increased, risks would still remain at acceptable levels. The assumption that a worker would perform these activities at the sites for 40 years is conservative and likely overestimates risks associated with this exposure pathway.

Shallow groundwater is not currently used for potable water. The low yields possible with this source also make it unlikely to be developed for this use in the future. The worst-case exposure may occur as indicated, for a well placed in the

lower aquifer where other wells in the area are located. The estimated concentrations, based on assumptions of pumping in the lower aquifer, would exceed the assumed dilution. As these concentrations generally represent localized contaminant areas, risks associated with development of the lower aquifer are overestimated.

Debate continues over the most appropriate methods to determine average and reasonable maximum exposure conditions. According to the guidelines, the 95 percent upper confidence limit on the arithmetic average should be used for calculating exposure. However, environmental data are not often normally distributed and samples are not randomly collected. Infrequently reported constituents preclude the ability to use these statistical methods.

Uncertainty is also associated with the method used to determine carcinogenic risks in humans. In discussing uncertainty, the EPA expressed the following opinion:

"It should be emphasized that the linearized multistage procedure leads to a plausible upper limit to the risk that is consistent with some proposed mechanism of carcinogenesis. Such an estimate, however, does not necessarily give a realistic prediction of the risk. The true value of risk is unknown, and may be as low as zero. The range of risks, defined by the upper limit given by the chosen model and the lower limit which may be stated as low as zero, should be explicitly stated (51 Federal Register 33998)."

The toxicological data base is also a source of uncertainty. EPA indicates some of the sources of uncertainty include extrapolation from high to low doses and from animals to humans; species differences in uptake, metabolism, and organ distribution; species differences in target site susceptibility; and human population variability with respect to diet, environment, activity patterns, and cultural factors.

Not all chemicals found at the site (e.g., lead) have been assigned critical toxicity values. Although lead is not included in the quantitative assessment, it did not exceed criteria proposed for soils nor would it be expected to transport to the

lower aquifer and be present at that exposure point in excess of drinking water standards.

6.6 ENVIRONMENTAL ASSESSMENT

A qualitative assessment was made of the potential environmental exposures in the vicinity of FANG. The assessment considered primarily the intermittently high levels of mercury (above the $0.2~\mu g/l$ Class III water quality criterion) and detectable concentrations of other compounds at a few surface water sampling locations at FANG. A site visit was made to identify unnatural stresses in flora or fauna present along the drainageways and to characterize the habitat and its potential to attract other sensitive biological receptors.

6.6.1 Setting

The drainageway extends approximately 5,000 feet across the FANG property in an easterly direction before entering a large wetland offsite. Another wetland northwest of FANG could be affected by shallow groundwater flow from Site 6. The northern drainageway (Reach 2) varies from 5 to 20 feet in width and from 2 inches to at least 3 feet deep in downstream pools. Surface water is clear and slow flowing; the drainageway appears to be continuously wet as a result of groundwater inflow.

The drainageway is inundated with cattails along its entire length, with occurrences of sawgrass, water pennywort, buttonbush, rushes, and mats of filamentous algae. The sediment consists of soft clayey material overlain by several inches of organic detritus and has no discernible odor.

6.6.2 Receptors

Aquatic organisms observed during an onsite inspection include the freshwater limpet, crayfish, numerous mosquitofish (*Gambusia affinis*) and several sunfish in deeper pools. Evidence of muskrat and armadillo activity was seen in and along the drainageway. Turkey vulture, killdeer, American robin, and white ibis were also observed.

No recognizable pollution stress was observed for vegetation or aquatic organisms in the drainageway. Further qualitative or quantitative sampling techniques would be necessary to more accurately detect environmental stress.

The Hazardous Materials Technical Center¹ reports that the Florida Game and Freshwater Fish Commission indicated that no endangered or threatened species of flora or fauna were observed in the vicinity of FANG. The center also reports that there are no areas designated as critical habitats or wilderness.

Tables 6-17 and 6-18 list 11 threatened plant species and 23 aquatic and terrestrial vertebrates listed as endangered, threatened, or species of special concern that have the potential to occur at FANG. None of these species was observed in the drainageway leading from the FANG property to the offsite wetland. Most of the listed vertebrate and invertebrate species are unlikely to make use of habitat on the FANG property because of unsuitable conditions. Species with the greatest potential for using the habitat in or along the drainageway are the American alligator, limpkin, little blue heron, snowy egret, tri-colored heron, American wood stork, kestrel, and peregrine falcon.

American alligators have been observed on the installation by FANG personnel. Alligators are unlikely to remain permanently in the drainageway, however, because of human disturbance, low water, and more optimal conditions in the nearby wetlands. Contaminated prey items, such as fish, crayfish, and amphibians, could be minimal indirect sources of exposure to onsite contaminants.

Wading birds, such as the limpkin, little blue heron, snowy egret, tri-colored heron, and American woodstork, may find portions of the drainageway suitable for occasional foraging on fish and invertebrates. The scarcity of the primary food of the limpkin, apple snails, in the area reduces the probability of limpkin presence. Exposure to wading bird species would be through direct ingestion of contaminated water, sediments, and food items such as fish and invertebrates.

The American kestrel prefers open areas for hunting and primarily eats insects. The bird is likely to occur in the area but its exposure to pollutants should be

minimal; the only potential source would be ingestion of emergent aquatic insects from the drainageway.

The peregrine falcon may use open areas on the FANG property for hunting small birds but should not be directly affected by surface water or sediment contamination.

6.6.3 Contaminant Levels

Mercury, chromium, cadmium, and lead were detected in onsite surface waters at concentrations exceeding the Class III surface water quality criteria, as shown in Table 6-19. The two contaminants that may be ecologically important at FANG are mercury and chromium. Mercury exceeded the water quality criterion in surface water samples, but its distribution is widespread and does not appear associated with specific activities at the eight sites. Groundwater concentrations of chromium at Site 6 are higher than Class III surface water quality criteria, which could potentially affect nearby wetlands. Mercury and chromium toxicities are described below. Information is also provided on the potential for aquatic and terrestrial toxicity from cadmium and lead.

Mercury

Mercury has been measured at two sampling points at concentrations exceeding the Florida criterion of 0.2 μ g/l for Class III surface waters; the highest concentration was 0.68 μ g/l at R1C. The downstream concentration was 0.35 μ g/l at DG-2. The most recent mercury criterion proposed by EPA for the protection of freshwater aquatic life is 0.012 μ g/l median (4-day average), not to exceed 2.4 μ g/l on an hourly average. Acutely toxic values of mercury for invertebrate species range from 2.2 μ g/l for Daphnia pulex to 2,000 μ g/l for three insects. Acute values for fishes range from 30 μ g/L for the guppy to 1,000 μ g/l for the Mozambique tilapia.

Methyl mercury is the most chronically toxic of the tested mercury compounds. Tests with *Daphnia magna* and brook trout produced chronic toxicity values of less than $0.07 \mu g/l$ for methyl mercury. Freshwater plants show a wide range of

mercury sensitivity, but the most sensitive plants appear less sensitive than the most sensitive freshwater animals to both mercury and methyl mercury. Therefore, freshwater organisms are more susceptible to mercury contamination.

Mercury can be bioconcentrated in organisms and biomagnified through food chains. BCFs (tissue concentration of a chemical divided by exposure concentration) are 4,000 to 85,000 for methyl mercury and about 5,000 for mercury. The primary concern at FANG is that mercury will pass from contaminated food items up the food chain to endangered species. For the protection of sensitive species of mammals and birds that regularly consume fish and other aquatic organisms, total mercury concentrations in prey items should probably not exceed 100 µg/kg fresh weight for birds and 1,100 µg/kg for small mammals.¹³

In fish, the biological half-life of mercury is approximately 2 to 3 years. Data concerning long-term exposure of fish to mercury indicate that concentrations above $0.23~\mu g/l$ caused statistically significant effects on the fathead minnow and caused the concentration of total mercury in the whole body to exceed 1.0 mg/kg.

Signs of mercury poisoning in birds include lack of muscular coordination, slowness, withdrawal, and slow response time. Acute oral toxicities of various mercury formulations ranged between 2.2 and 31.0 mg/kg body weight for most bird species tested. Sublethal adverse effects of mercury on birds have been noted for growth, development, reproduction, blood and tissue chemistry, metabolism, and behavior. The proposed mercury criterion for protection of birds is a daily dose of less than 640 μ g/kg.

Mercury has not been detected consistently at the two sites on FANG where it has been measured. The presence of mercury at FANG may be related to the chronic low levels of mercury found statewide. Specific sources of mercury in Florida are unknown, but the levels found may be the result of its ubiquitous occurrence in nature, smoke stack emissions, runoff of agricultural pesticides, or discharge from industrial plants.

The fluctuations in mercury concentrations in surface water samples indicate that aquatic organisms are not chronically exposed to high levels of mercury and,

therefore, are unlikely to be adversely affected. Fish tissue analysis could be used to evaluate long-term exposure and potential impacts on aquatic or terrestrial food chains.

Chromium

Chromium was measured at a maximum concentration of 152 μ g/l in groundwater. At this level, chromium could impact adjacent wetlands if groundwater were to infiltrate the low lying areas.

Chromium occurs in natural water bodies as trivalent chromium, hexavalent chromium, or both. The chemical and toxicological properties of the two oxidation states appear quite different, and the toxicities of the two states have not been shown to be additive. Records of acute toxicities of hexavalent and trivalent chromium salts to representative aquatic species confirm that hexavalent chromium is more toxic to freshwater biota in comparatively soft and acidic waters. Based on the reducing conditions observed at FANG (Section 6.2.2), chromium is expected to be present in groundwater in the trivalent form.

The acute toxicity of hexavalent chromium to aquatic species appears to increase as pH and/or hardness decrease. Bioaccumulation has been found to vary among species; concentrations are normally highest at lower trophic levels and the lowest with the top predators, indicating that biomagnification does not occur. A BCF of 3.4 was found for hexavalent chromium in rainbow trout. Ambient water quality criteria for hexavalent chromium are not to exceed 0.29 µg/l as a 24-hour average and not to exceed 21 µg/l at any time. 16

Acute values for trivalent chromium for freshwater animal species range from 2,221 μ g/l for a mayfly to 71,060 μ g/l for a caddisfly.¹⁷ A BCF has not been measured with freshwater organisms for trivalent chromium. For hardness values of 50, 100, and 200 mg/l as CaCO₃, the ambient water quality criteria established for 4-day average concentrations of trivalent chromium are 120, 210, and 370 μ g/l, respectively. The 1-hour average concentrations for the same hardness values are 980, 1,700, and 3,100 μ g/l.¹⁷

The average chromium concentration reported in surface water at FANG does not exceed Class III surface water quality criteria or FAWQC for trivalent chromium.

Cadmium

In aquatic systems, hardness affects the toxicity of cadmium. Chronic toxicity values for fathead minnows and *Daphnia magna* tested over a range of hardness found a significant correlation between hardness and toxicity. Ambient water quality criteria state that the freshwater organisms will not be unacceptably affected if the 4-day average concentration does not exceed e(1.128[ln(hardness)]-3.828) in µg/l, and if the 1-hour average concentration is not in excess of e(0.7852[ln(hardness)]-3.490) in µg/l, more than once in 3 years. Using a hardness of 50 mg/l CaCO₃, the acute criterion for cadmium is 1.8 µg/l and the chronic criterion is 0.66 µg/l. In a 21-day test, a 16 percent reduction in reproduction at 0.7 µg/l (nominal concentration) was found. Chronic toxicities of cadmium to *Daphnia pulex* were found at less than 1 µg/l and 10 µg/l. BCFs for cadmium in freshwater range from 3 for brook trout muscle to 12,400 for whole body mosquitofish. Accumulated cadmium is slowly depurated by freshwater organisms.

There is no evidence that cadmium is an essential mineral.¹⁹ Mammals have no effective mechanism for the elimination of ingested cadmium; therefore, with time, the cadmium tends to accumulate in the liver and kidney. It tends to be very persistent in the kidney and can cause renal tubular damage.²⁰ Toxic effects include decreased growth rates, anemia, infertility, fetal abnormalities, abortions, kidney disease, intestinal disease, and hypertension. The acute oral LD₅₀ for cadmium sulfide is greater than 5,000 mg/kg.²¹ In a 30-month study with rats, elevated blood pressure occurred at the lowest level tested, 1 ppm.²⁰ Mallard ducks were chronically dosed with cadmium-contaminated food and found to have significant effects on energy metabolism at 450 mg/kg. The maximum tolerable level set by the National Academy of Science²⁰ for domestic mammals and poultry is 0.5 ppm.²²

Lead

The primary mechanism of acute toxicity of lead to freshwater organisms is unknown. In acute assays, invertebrate species are more sensitive than vertebrate species. The lowest maximum acceptable toxicant concentration from chronic studies is 19 mg/l for rainbow trout (*Salmo gairdneri*) at a water hardness of 128 mg/l CaCO₃. Lead toxicity decreases with increasing water hardness. EPA has established 4-day and 1-hour average concentration criteria for lead not to be exceeded by the values given by $e^{(1.273[ln(hardness)]-4.705)}$ and $e^{(1.273[ln(hardness)]-1.460)}$, respectively, more than once every 3 years.²³ Using an average water hardness of 50 mg/l CaCO₃, the 4-day and 1-hour criteria correspond to 1.3 and 34 μ g/l, respectively.

In American kestrels (Falco sparverius) fed 10 or 50 mg/kg lead in the diet for 7 months, no effects were noted with respect to survival, egg laying, initiation of incubation, or egg shell thickness. In 1-day-old American kestrels fed 125 or 625 mg/kg body weight lead for 10 days, growth was seriously depressed by day 6, and hematocrit values were significantly depressed by day 10. Forty percent of the birds receiving 625 mg/kg lead died within 6 days. No effects were observed in kestrels exposed to 25 mg/kg body weight. The 50-mg/kg level is the highest No Observable Effect Level identified for birds based on the studies reviewed.²²

Lead inhibits plant growth and reduces photosynthesis, mitosis, and water absorption.²⁴ Inhibition of photosynthesis is attributed to the blocking of protein sulfhydryl groups and to changes in phosphate levels in the cell.²⁴ Normal germination rates were observed at soil lead levels of 46 mg/kg but other adverse effects were observed at lead levels of 12 to 312 mg/kg in soil.²⁴

6.6.4 Summary

Class III surface water quality criteria for mercury, chromium, and cadmium were exceeded in onsite drainageway samples but only mercury was found above the standard downstream of FANG. Mercury has the potential to bioaccumulate in animal tissue and biomagnify through the food chain. The source of the mercury has not been identified, nor has it been clearly established as migrating from any

of the sites on FANG. Chromium detected in Site 6 groundwater could migrate to a nearby wetland, although the slow rate of migration and dilution effects make it unlikely that the concentrations that ultimately enter the wetland will exceed Class III criteria. Cadmium was not detected in downstream surface water samples above the applicable criterion and is unlikely to have an ecological impact.

Table 6-1
MAXIMUM CONTAMINANT CONCENTRATIONS AND FREQUENCY OF
DETECTION IN SITE INVESTIGATION GROUNDWATER SAMPLES
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Contaminant	Range of Detected Concentrations	Frequency of Detection	Average ^a
Site 1			
Benzene	41	1/8	
Toluene	1	1/8	
Xylenes	13 J	1/8	
Bis(2-ethyl hexyl)phthalate	4 BJ	1/1	
Arsenic	2.8 J - 8.2 J	2/2	5.5 J
Barium	360	1/1	
Cadmium	3.95 J	1/1	
Chromium	107.65 - 152	3/3	123.88
Lead	4 B - 66.75	8/8	28.37 BJ
Mercury	0.2 J	1/1	
Selenium	0.94 J - 1.4 J	2/2	1.04 J
Site 2			
Benzene	2 - 5	2/7	
Ethyl Benzene	3 J - 7 J	2/7	
Toluene	2	1/7	
Xylenes	1.2 - 160 J	4/7	24.67 J
Lead	5.6 - 1,200 J	5/5	390.3 J
Site 3			
Benzene	25 - 35	3/13	
Ethyl Benzene	1 J - 29	4/13	
Toluene	2 - 17	4/13	
Xylenes	7 J - 120	3/13	
Chloroethane	2.8	1/3	
1,1-Dichloroethane	3.9 - 13 J	3/13	
t-1,2-Dichloroethane	12 J - 24 MJ	2/10	
Methylene Chloride	8	1/1	
Vinyl Chloride	4 J	1/10	
2-Hexanone	9 J	1/1	
4-Methyl-2-Pentanone	73	1/1	
Acetone	2,500 J	1/1	
Bis(2-ethyl hexyl)phthalate	3 BJ	1/1	·
Chlorobenzene	2	2/10	

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Table 6-1 (continued)

	Range of		
	Detected	Frequency of	
Contaminant	Concentrations	Detection	Average ^a
Arsenic	6 J	1/1	
Barium	574	1/1	
Chromium	46 M	1/1	
Lead	2.6 B - 31.2 J	13/13	11.65 BJ
Mercury	0.41 L	1/1	
Selenium	1.5 J	1/1	
Site 4			
Benzene	5	1/3	
Ethyl Benzene	2 J - 4 J	2/3	3 J
Toluene	2 - 3	2/3	2.5
Xylenes	25.5 - 26	2/3	25.75
4-Methyl Phenol	210	1/1	
Benzoic Acid	1,300 J	1/1	
Chlorobenzene	1 J	1/3	
Arsenic	5.2 J	1/1	
Barium	34.1 J	1/1	
Cadmium	3.1 J	1/1	
Chromium	25.7 J	1/1	
Lead	3.8 - 17.45	3/3	10.65
Mercury	0.2 J	1/1	
Site 5			
Benzene	1.8 - 60	3/8	
Ethyl Benzene	19 J - 36	2/8	
Toluene	1	1/8	
Xylenes	1 - 29	3/8	
Chloromethane	1 J	1/3	
Arsenic	2.7 J	1/1	
Barium	48 J	1/1	
Cadmium	4 J	1/1	
Chromium	7.7 J	1/1	
Lead	2.2 J	1/1	
Mercury	0.16 J	1/1	
Site 6			
Ethyl Benzene	6 J	1/3	
Xylenes	1	1/3	- -

Table 6-1 (continued)

Contaminant	Range of Detected Concentrations	Frequency of Detection	Average ^a
Chloromethane	1 J	1/3	
Trichloroethane	1 J	1/3	
Arsenic	1 J	1/3	
Barium	121 J - 245	3/3	194 J
Chromium	32.3 - 128	5/5	89.02
Lead	12.4 - 32.4	3/3	22
Mercury	0.41 J - 0.53 J	3/3	0.46 J
•		-,-	
Site 7			
Lead	4.8 B - 10.6	7/7	6.4 B
Site 8			
Benzene	7 - 26	2/7	
Ethyl Benzene	12 J - 150 J	2/7	
<u>Naphthalene</u>	26 - 89	2/4	29.25
Toluene	2 - 39	3/7	
Xylenes	28 - 430	3/7	
1-Methyl Naphthalene	28	1/3	
2-Methyl Naphthalene	44 - 45	2/4	22.75
t-1,2-Dichloroethene	2 J	1/4	
Vinyl Chloride	1 &J	1/4	
4-Methyl Phenol	4 J	1/1	
Bis(2-ethyl hexyl)phthalate	6 BJ	1/1	
Chlorobenzene	9 J - 35 J	2/4	11.25 J
1,2-,1,4,-Dichlorobenzene	2 J - 34 J	4/5	8.70 J
1,3-Dichlorobenzene	2 J - 6 J	3/5	2.50 J
Arsenic	3 J	1/1	
Barium	334	1/1	
Cadmium	3.8 J	1/1	
Chromium	7.5 J	1/1	
Lead	1.9 B - 26.5	4/4	8.44 B
Mercury	0.49 J	1/1	

Notes:

B = Analyte was not detected above five times the value reported in laboratory blanks.

Table 6-1 (continued)

- J = Estimated. Analyte was present but the reported value may not be accurate or precise.
- M = Duplicate precision was not met. It is not possible to determine whether the resulting bias is high or low.
- & = Combined vinyl chloride and dichlorofluoromethane (used packed column to meet the holding time).

^aArithmetic mean concentrations are calculated using all values. Values below the detection level are assumed to be at one-half the detection level. Averages were not calculated if less than 50 percent of the samples were detects.

Table 6-2
CONTAMINANT CONCENTRATIONS AND FREQUENCY OF DETECTION
IN SITE INVESTIGATION SOIL SAMPLES
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Contaminant	Maximum Concentration (mg/kg)	Sites 1, 3-7 Average Concentratio (mg/kg)		Maximum Concentration (mg/kg)	Site 8 Average Concentration (mg/kg)	n ^a Frequency	Backgrou Concentra (mg/kg	ation
Arsenic	1.2 K	0.55	7/7	1.1 J	1.1	1/1	0.14	J
Barium	5.9 J	4.3	7/7	51.9	20.2	9/9	3.1	J
Cadmium	0.62		1/7	< 0.21	< 0.21	0/1	<0.19	
Chromium	4.9	3.1	7/7	8.6	5.4	9/9	1.8	
Lead	9 K	3.9	21/21	14.7 K	5.2	11/11	3.4	
Selenium	0.33 J	0.19	5/7	<0.11	<0.11	0/1	<0.13	
Xylenes	0.6		1/21	<0.1		0/3		

Notes:

J = Estimated. Analyte was present but the reported value may not be accurate or precise.

K = Analyte was present but the reported value may be biased high; the actual value is expected to be lower.

^aArithmetic mean concentrations are calculated using all values. Values below the detection level are assumed to be at one-half the detection level. Averages were not calculated if less than 50 percent of the samples were detects.

MAXIMUM CONTAMINANT CONCENTRATIONS AND FREQUENCY OF DETECTION IN SITE INVESTIGATION SURFACE WATER AND SEDIMENT SAMPLES FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA 125TH FIGHTER INTERCEPTOR GROUP, Table 6-3

		Background	Concentration	(mg/kg)	0.87	9.1	<0.22	4.6	18.6	<0.1	<0.1	<0.93											
			0	Frequency Average ^a (mg/kg)	0.47 J	26.95	:	5.25	6.15	;	1	;											
	Downstream			requency	272	2/2	1/2	2/2	2/2	0/2	0/2	2/0											
ıt	Down	Range of Detected	Concentration	(mg/l)	0.44 J - 0.5 J	19.1 - 34.8	0.280 J	4.5 - 6.0	6.1-6.2	<0.1	<0.15	<0.94											
Sediment				Frequency Average ^a	1.48 J	32.25 J	3.7 J	46.55 L	72 L	:	:	i		;	ŀ	ł	ł	i	i	ŀ	1	;	ł
	Drainageways	,		requency	4/4	4/4	4/4	4/4	12/12	1/4	1/4	0/4		-	1/12	1/12	3/12	2/12	1/12	0/12	0/12	2/12	1/12
	Drain	Range of Detected	Concentrations	(mg∕l)	0.49 J - 3.3	2.3 J - 50.4	0.37 J - 10.3	7.5 L - 119 L	5.1 L - 364 L	0.13 JA	0.16 J	<1.1	(µg/kg)	400 J - 600 J	1,000	1,000	200 - 6,500	100 J - 200 J	800 J	⊽	7	1,600 J - 7,100	10,900
				Average ^a	0.78 J	36.55 J	;	i	2.5 B	0.21	:	1										_	
	Downstream			Frequency					1/2														
Water	Down	Range of Detected	Concentrations	(hg/l)	1.4 J	32.8 J - 40.3 J	<1.6	<5.5	2.5 B	0.35	<1.1	<6.7											
Surface V				Average ^a	1.44 BJ	66.7 J			27.34	:	:	;			ł	:	1	:	ŀ	ŧ	1	ł	;
	Drainageways			Frequency	2/4	4/4			4/4	1/4	1/4	1/4		0/4	1/4	1/4	1/4	0/4	9/4	1/4	1/4	1/4	1/4
	Drain	Range of Detected	Concentrations	(μg/l) F	0.78 B - 4.3 J	35.4 J - 145 J	9.3 - 17.25	3.4 J - 122	4.2 - 41.9	99.0	1.1 J	4.7 J		v	1,385 J	140 J	685 J	7	⊽	99.5 J	460 J	1,100	155
				Contaminant	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver		Trichlorofluoromethane	Toluene	Ethyl Benzene	Xylenes	1,4-Dichlorobenzene	1,2-Dichlorobenzene	Methyl-tert-butyl ether	Benzene	Napthalene	2-Methyl Napthalene

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Notes:

 $A = 0.6 \mu g/l$ in rinse blank.

B = Analyte was not detected above five times the value reported in the laboratory blank. J = Estimated. Analyte was present but the reported value may not be accurate or precise. L = Analyte was present but the reported value may be biased low. The actual value is expected to be higher.

^aArithmetic mean concentrations are calculated using all values. Values below the detection limit are assumed to be at one-half the detection level. Averages were not calculated if less than 50 percent of the samples were not detects.

Table 6-4 SITE CONTAMINANTS AND ASSOCIATED MEDIA 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Contaminant	Groundwater	Soil	Surface Water	Sediment
Arsenic	X	X	X	X
Barium	X	X	X	X
Cadmium	X	X	X	X
Chromium	X	X	X	X
Lead	X	X	X	X
Mercury	X		X	X
Selenium	X	X	X	X
Silver			X	
Benzene	X		X	
Toluene	X		X	X
Ethyl Benzene	X		X	X
Xylene	X	X	X	X
Naphthalene	X		X	X
1-Methyl Naphthalene	X			
2-Methyl Naphthalene	X		X	X
Chlorobenzene	X			
Dichlorobenzene	X			X
Phenol			x	
4-Methyl Phenol	X			
Chloromethane	X			
Methylene Chloride	X			
1,1-Dichloroethane	X			
t-1,2 Dichloroethene	X			
Vinyl Chloride	X			
Chloroform			X	
Bromomethane				X
Trichlorofluoromethane				X
1,1,1 Trichloroethane	X			
Acetone	X			
2-Hexanone	X			
4-Methyl 2-Pentanone (MIBK)	X			
Benzoic Acid	X			
Polynuclear Aromatic Hydrocarb	ons			X
Bis(2-ethyl-hexyl)phthalate	X		X	X
Ethylene dibromide			X	

Table 6-5
CHEMICAL/PHYSICAL PROPERTIES OF SELECTED ORGANIC CHEMICALS
125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD
JACKSONVILLE, FLORIDA

(g/mole) 2 78 4 106 5 133 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9			Constant	Koc	Log	BCF	
71-43-2 78 100-41-4 106 108-88-3 92 108-88-3 92 1330-20-7 106 1330-20-7 106 1330-20-7 106 1340-41-3 99 145-61-4 137 15-69-4 137 17-69-4 137 17-69-4 137 17-69-4 137 17-69-4 137 17-69-4 137 17-69-4 137 17-69-4 137 17-69-4 137 17-69-7 113 18-69-7 113 18-69-7 113 18-69-7 113 18-69-7 113	CAS# (g/mole) (mg/l)	A) (mm Hg)	(atm-m3/mol)	(ml/g)	Kow	(I/kg)	
thane 1100-41-4 106 108-88-3 92 (108-88-3 92 (108-88-3 92 (108-88-3 92 (108-88-3 92 (108-88-3 92 (108-90-7 106 (108-90-7 113 147 118-90-7 113 4 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 113 108-90-7 1		+03 9.52E+01	5.59E-03	83	2.12	5.2	
108-88-3 92 1330-20-7 106 1330-20-7 106 1330-20-7 106 1330-20-7 106 1330-20-7 106 1330-20-7 106 1330-20-7 1330-20-7 1330-20-7 108-90-7 113 4 108-90-7 113 108-90-7 1	106	•		1100	3.15	37.5	
thane 71-55-6 133 130-20-7 106 131 131 131 131 131 131 131 131 131 13		•	6.37E-03	300	2.73	10.7	
thane 71-55-6 133 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	106	+02 1.00E+01	7.04E-03	240	3.26		
ane (trans) 540-59-0 97 6 ene (trans) 540-59-0 97 6 T5-69-4 137 1 zene 95-50-1 147 1 zene 95-50-1 147 1 zene 106-46-7 147 7 108-90-7 113 4	133	+03 1.23E+02	1.44E-02	152	2.50	5.6	
ene (trans) 540-59-0 97 methane 75-69-4 137 zene 95-50-1 147 zene 541-73-1 147 in 106-46-7 147 in 108-90-7 113 in 108-90-7 113	66		4	30	1.79		
zene 75-69-4 137 13	76	•	6.56E-03	89	0.48	1.6	
zene 95-50-1 147 1 zene 95-1-73-1 147 1 106-46-7 147 7 1 108-90-7 113 4	137	+03 6.67E+02		159	2.53		
zene 95-50-1 147 1 zene 541-73-1 147 1 zene 106-46-7 147 7 108-90-7 113 4	63	71	8.19E-02	22	1.38	1.17	
zene 541-73-1 147 1 zene 106-46-7 147 7 108-90-7 113 4		+02 1.00E+00	1.93E-03	1700	3.60	26	
zene 106-46-7 147 108-90-7 113 4	147	•	•	1700	3.60	56	
108-90-7 113 4	147			1700	3.60	56	
7 07 07 0 70 71	113	+02 1.17E+01	3.72E-03	330	2.84	10	
) OC C-/9-+/		+03 4.30E+03	4.40E+02	35	0.95		
Naphthalene 91-20-3 128		7 0.053	4.80E+04	962	3.30	95	

Table 6-6
POTENTIAL EXPOSURE PATHWAYS
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL, GUARD, JACKSONVILLE, FLORIDA

Source	Release/ Transport	Exposure Point	Exposure Route	Potential Receptors	Land Use	Retain Pathway	Rationale
Contaminated Surface Soil and Groundwater	Volatiliza- tion/Air	Onsite	Inhalation	Workers/ Visitors	Current	° X	Low concentration of volatile constituents; paving and vegetative cover; site access is restricted. Primary releases to air are predominantly from ongoing facility activities.
	Direct Contact with Soils	Onsite	Incidental Ingestion, Dermal Absorption	Workers	Current	Yes	Workers may occasionally perform routine maintenance in these areas.
	Leaching/ Groundwater	Onsite Wells	Ingestion, Dermal Absorption, and Inhalation	Workers	Current or Future	°Z	No uses currently exist for onsite shallow groundwater or are expected in the foreseeable future.
				Workers	Future	Yes	Use of deep aquifer as a supply well is possible in this area.
		Offsite Wells	Ingestion, Dermal Absorption, Inhalation	Residents	Current or Future	°Z	The nearest residences are 0.75 mile to the west, and regional Floridan aquifer groundwater appears to flow west to east. Onsite gradients are low, and shallow groundwater migrates toward the drainageways.
	Groundwater/ Surface Runoff	Discharge to Drainageways	Dermal Absorption and Incidental	Workers	Current	Š.	Site access is restricted; the drainageways do not have sufficient flow for recreational uses.

Rationale	Discharges occur and organisms are present.	People might fish in this area.
Retain Pathway	Yes	Yes
Land Use	Current	Current
Potential Receptors	Aquatic Organisms	People Who Ingest Fish from Downstream
Exposure Route	Bioconcentra- tion and Ingestion	Ingestion of Fish
Exposure Point	Drainageways, Cedar Creek	Cedar Creek
Release/ Transport	Groundwater/ Surface Runoff	

Table 6-7
WELL INVENTORY INFORMATION
125TH FIGHTER INTERCEPTOR GROUP,
FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

JBES ^a Refer. No.	Depth (ft)	Use	Comments
J1624	NA	Fire Protection	
J1625	650 .	Fire Protection	92 gpm yield
J1626	NA.	Fire Protection	
J1627	NA	Fire Protection	May be plugged
J367	NA	NA	Floridan aquifer
D563	150	NA	•
J2477	700	Irrigation	Drilled in 1980
J3170	660	Irrigation	33 gpm natural flow
J6073	13	Monitoring	2 wells near UST
J6162	10	Monitoring	3 wells at FANG
b	1,200+	Public Supply	JIA Floridan aquifer well ^c
b	1,200+	Public Supply	JIA Floridan aquifer well
b	NA	Fire Protection	FANG fire protection well

^aInformation from Jacksonville Bio-Environmental Services (JBES) well inventory.

^bNot included in JBES records. Information on these wells was obtained through interviews with FANG personnel.

^cJIA = Jacksonville International Airport.

Table 6-8 REFERENCE DOSES AND CANCER POTENCY FACTORS USED IN RISK ASSESSMENT 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Contaminant	EPA Carcinogen Classification	Carcinogenic Potency Factor (kg-day/mg)	RfD (mg/kg/day)	
Benzene	A	0.029		
Ethyl Benzene	•	•	0.1	
Naphthalene	•		0.4	
Toluene	D	•	0.3	
Xylenes	D	-	2	
t-1,2-Dichloroethene			_	
1,1,1-Trichloroethane	•	•	0.09	
1,1-Dichloroethane	С	0.091	0.009	•
Chloromethane	C	0.013	•	
Trichlorofluoromethane	-	•	0.3	
Vinyl Chloride	A	2.3	•	
t-1,2-Dichloroethene	D	•	0.02	•
1,2-Dichlorobenzene	•	•	0.09	
1,4-Dichlorobenzene	C	0.02	0.1	
4-Methylphenol	-	•	0.5	
Benzoic acid	-	-	4	
Chlorobenzene	D	•	0.02	
Arsenic	A	1.5		
Barium	-	-	0.05	
Cadmium	•	-	0.0005 X	
Chromium III	-	•	1	
Chromium VI	-	•	0.005	
Lead	•	•	-	
Mercury (alkyl and inorganic)	•	•	0.000158	
Selenium	•	•	0.003	

Notes:

X= Risk Assessment Is Under Review By An EPA Work Group. Health Advisories, NTIS, No. PB87-235586, March 1987, Give 0.0005 mg/kg/day.

Source of RfDs: Integrated Risk Information System (EPA, 1990).

Table 6-9 TOXICOLOGICAL PROFILES FOR HUMAN HEALTH EFFECTS 12STH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

•	Chemical	Acute oral exposure can cause muscular	Chronic Toxicity Summary ^a	Cancer Potential Known human	Other May be essential. Toxicity
•	Arsenic	Acute oral exposure can cause muscular cramps, facial swelling, cardiovascular reactions, severe gastrointestinal damage, and vascular collapse leading to death. Sensory loss and hematopoietic symptoms delayed after exposure to high concentrations are usually reversible. Inhalation exposures can cause severe irritation of nasal lining, larynx, and bronchi.	citronic of all of ninatation exposure can produce changes in skin, including hyperpigmentation and hyperkeratosis; peripheral neuropathy; liver injury; cardiovascular disorders; oral exposures associated with peripheral vascular disease, blackfoot disease.	carcinogen; oral exposures associated with skin and liver cancer, inhalation exposures with lung cancer.	varjes for different compounds; inorganic trivalent arsenic compounds usually more toxic than pentavalent compounds; high doses of some inorganic arsenic compounds to pregnant laboratory animals produced malformations in offspring.
6-43	Barium	Ingestion of barium salts can cause prolonged muscular stimulation; gastroenteritis; hypokalemia; and cardiovascular effects such as ventricular fibrillation and extra systoles.	Prolonged occupational inhalation has resulted in baritosisa benign, reversible pneumoconiosis.	Not applicable.	Toxicity of compounds depends on solubility.
	Benzene	Acute exposures (inhalation) to high levels of benzene may lead to depression of the central nervous system, unconsciousness, and death, or may cause fatal cardiac arrhythmias.	Major toxic effect is hematopoietic toxicity (affects formation of blood); chronic exposure of workers to low levels has been associated with blood disorders such as leukemia and aplastic anemia (depression of all three cell types of the blood in absence of functioning marrow).	Sufficient evidence that it is a human and animal carcinogen; strong correlation between exposure to benzene by inhalation and leukemia.	Chromosomal aberrations in bone marrow and blood have been reported in experimental animals and some workers.
	1,1-Dichloro- ethane	CNS depression may occur when 1,1-dichloroethane is inhaled at high concentrations. Irritating to skin.			
	trans-1,2- Dichloro- ethylene	Inhalation exposure to high levels can cause narcosis and death in rats.	Rats exposed by inhalation exhibited fatty accumulation in liver and infiltration of lungs.		

	Chemical	Acute Toxicity Summary ^a	Chronic Toxicity Summary ^a	Cancer Potential	Other
6	Cadmium	For acute exposures by ingestion, symptoms of cadmium toxicity include nausea, vomiting, diarrhea, muscular cramps, salivation, spasms, drop in blood pressure, vertigo, loss of consciousness, and collapse. Acute renal failure, liver damage, and death may occur. Exposure by inhalation can cause irritation, coughing, labored respiration, vomiting, acute chemical pneumonitis, and pulmonary edema.	Respiratory and renal toxicity are major effects in workers. Chronic oral exposures can produce kidney damage. Cadmium accumulates in kidney, and nephropathy results after critical concentration in kidney is reached, probably about 200 µg/g. Inhalation can cause chronic obstructive pulmonary disease, including bronchitis, progressive fibrosis, and emphysema. Chronic exposure affects calcium metabolism and can cause loss of calcium from bone, bone pain, osteomalacia, and osteoporosis. Chronic exposure may be associated with hypertension. Cadmium can produce testicular atrophy, sterility, and teratogenic effects in experimental animals.	Increased risk of prostate cancer and perhaps respiratory tract cancer in workers exposed by inhalation. No evidence of carcinogenicity from chronic oral exposure.	A nonessential element.
5-44	Chromium	Major acute effect from oral exposure is renal tubular necrosis. Inhalation of chromate salts results in irritation and inflammation of nasal mucosa, ulceration, and perforation of nasal septum.	Chronic exposure to hexavalent chromium has resulted in kidney damage in animals and humans. Inhalation exposures to chromates in industrial settings have resulted in nasal membrane inflammation, chronic rhinitis, laryngitis, and pharyngitis. Exposures to skin can result in allergic skin reactions in sensitive individuals. Overall, hexavalent forms are usually more toxic than trivalent forms.	Excess lung cancer has been associated with chromate-producing industry workers. Chromate salts are carcinogenic in rats exposed by inhalation.	Essential element. Toxicity is related to valence state.
	Ethyl Benzene	Ethyl benzene is irritating to eyes, mucous membranes, and skin. It can cause headaches and narcosis.			

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5	Chemical	Acute Toxicity Summary	Chronic Toxicity Summary
Lead		Acute inorganic lead intoxication in humans is	Chronic low levels of exposure to lead
		characterized by encephalopathy, abdominal	affect the hematopoietic system, the ne
		pain, hemolysis, liver damage, renal tubular	system, and the cardiovascular system.
		necrosis, seizures, coma, and respiratory	inhibits several key enzymes involved in

arrest

hemebiosynthesis. One characteristic effect of chronic lead intoxication is anemia by reduced exposure has resulted in nervous system injury induced nervous system injury. Lead can also have indicated that chronic lead exposure may be associated with increased blood pressure in he cardiovascular system. Lead reaction time, visual motor performance, and matopoietic system, the nervous humans. Exposure to lead is associated with gingival lead lines. Epidemiological studies nerve conduction velocity. The developing levels of exposure to lead can including reduced hand-eye coordination, sterility, abortion, neonatal mortality, and child appears especially sensitive to leadal key enzymes involved in morbidity. Organolead compounds are affect the immune system and produce hemoglobin production and shortened erythrocyte survival. In humans, lead neurotoxic. Occupational exposure to inorganic mercury can produce effects on nervous system, including tremors, erethism, muscular weakness, personality changes, gingivitis, and colored eye reflex. In children, pink disease has been reported after ingestion of mercurous compounds. Exposure to organic mercury can cause sensory and visual disturbances, tingling, paresthesiae, numbness, tunnel vision leading to blindness, weakness in extremities and progressive ataxia, tremor, cerebral atrophy, and degeneration of nerves; visual, peripheral neuropathy; and death.

bronchitis and nervous system effects. Oral exposure can result in abdominal cramps, gastrointestinal effects, ulceration, shock,

circulatory collapse, and renal failure.

Inhalation of mercury vapor can cause

Mercury

6-45

sensitive to low level effects.

Children are especially

Other

Cancer Potential

Lead salts have some

evidence of carcinogenicity in animals.

Mercury crosses placenta.
Toxicity depends on chemical form. Metallic, organic, and inorganic compounds can be biotransformed.

Other

Toluene

Chemical

Humans exposed by inhalation experimentally or occupationally or by intentional abuse may exhibit excitation, then CNS depression and necrosis; neurotoxic effects include nausea, fatigue, and incoordination at low levels and confusion, ataxia, and weakness at higher levels; in rats, irritation of mucous membranes and incoordination have been observed, as well as pulmonary irritation with subchronic exposure.

1,1,1-Trichloro-

Trichloroethane is a central nervous system depressant and may impair psychophysiological functions. Human fatalities have been reported following deliberate inhalation or occupational exposures; lung congestion was found.

Vinyl Chloride

6 - 46

Acute occupational exposure to high concentrations of vinyl chloride can produce symptoms of narcosis in humans. Respiratory tract irritation, bronchitis, headache, irritability, memory disturbances, and tingling sensations may also occur. Deaths have been reported. In animals, ataxia, narcosis, blood clotting difficulties, congestion and cdema in lungs, and kidney and liver effects have been demonstrated; at high doses, excitement, contractions, convulsions, and an increase in respiration followed by respiratory failure precede death.

CNS effects have been reported in workers, such as disturbances in memory and thinking, psychomotor skills, visual accuracy, sensorimotor speed, and performance tests; indications of cerebral and cerebellar dysfunction include tremors, ataxia, and equilibrium disorders; bizarre behavior and emotional lobility may occur. In cases of abuse, changes in liver and kidney function have been observed. In rats, a decrease in hematocrit has been reported.

Exposure by inhalation can produce liver damage in mice and affects drug metabolism in liver of rats.

Human health effects associated with chronic occupational exposure to vinyl chloride include hepatitis-like liver changes, decreased blood platelets, enlarged spleens, decreased pulmonary function, acroosteolysis (sometimes with Raynaud-like syndrome), sclerotic syndrome, thrombocytopenia, cardiovascular and gastrointestinal toxicity, and disturbances in vision and in the central nervous system. In laboratory animals, the liver and kidney toxicity may be severe and histopathological changes in lung and spleen may also occur with vinyl chloride exposure.

Embryotoxicity and possible teratogenicity in mice have been reported in an abstract; in rats, skeletal retardation of offspring has been described.

Mutagenic in some vitro tests.

Vinyl chloride is a known human carcinogen causing liver angiosarcomas (a very rare tumor in humans) and possibly increasing incidence of tumors of the brain, lung, and hemolymphopoietic system in humans. Vinyl chloride is carcinogenic in mice, rats, and hamsters.

Vinyl chloride is mutagenic in several test systems. Chromosome aberrations have been reported in exposed workers. In humans, possible relationships between exposure and birth defects and fetal death have been reported; possible increased fetal mortality among wives of occupationally exposed workers has been debated; increased skeletal variants were found in offspring of mice exposed during gestation.

Table 6-9 (Continued)

Chemical	Acute Toxicity Summary ^a	Chronic Toxicity Summary ^a	Cancer Potential	Other
Xylene	Acute exposures to inhaled xylene can depress the central nervous system and irritate mucous membranes.	Changes in behavioral tests, manual coordination, balance, and electroencephalographic patterns have been reported in humans exposed to xylenes; development of tolerance against some of these effects has been described. Effects on liver of rats have been reported.		

^aHealth effect or target organ may be based on animal studies and does not imply that the results of exposure to humans will be the same.

Sources:

Documentation of the Threshold Limit Values, American Conference of Governmental Industrial Hygienists, Inc. (1980, 1984). Toxicology, 3rd edition, C.D. Klaassen, M.O. Amdur, and J. Doull, eds., Macmillan Publishing Co., New York (1986). Monographs, Vol. 3, 20, 23, International Agency for Research on Cancer, Lyon, France (1973, 1979, 1980). Drinking Water and Health, Vol. 1, National Academy of Sciences (1977). Handbook of Toxic and Hazardous Chemicals, M. Sittig, Noyes Publications, Park Ridge, New Jersey (1981). EPA health advisories for inorganics, organics, and pesticides (March 1987). Experimental and Clinical Neurotoxicology, P.S. Spencer and H.H. Schaumburg, eds. Williams and Wilkins, Baltimore (1980). Pesticides Studied in Man, W.J. Hayes, Williams and Wilkins, Baltimore (1982). 29 CFR 1910:50412-50499, December 10, 1985; OSHA, Occupational Exposure to Formaldehyde.

Table 6-10 NON-CARCINOGENIC RISKS FROM SOIL INGESTION EXPOSURE AT FANG 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

			Average Chronic		
Contaminant	Reference Dose (RfD) (mg/kg/day)	Maximum Concentration (C) (ug/kg)	Daily Intake (mg/kg/day)	Intake/ RfD	Intake Exceeds RfD?
Arsenic		1200 K			
Barium	0.05	51900	2.00E-07	4.00E-06	No
Cadmium	0.0005	620	3.00E-09	6.00E-06	No
Chromium VI	0.005	8600	4.00E-08	8.00E-06	No
Lead		14700 K	2.00E-08		
Selenium	0.003	330 J	2.00E-09	7.00E-07	No
Xylenes	2	600	3.00E-09	1.00E-09	No
Hazard Inde	x (Sum of Intak	e/RfD)	-	2.00E-05	

Exposure Assumptions

Exposed Individual	Adult Worker
Soil Intake (IR) (mg/day)	10
Body Weight (BW) (kilograms)	70
Exposure Frequency (EF) (days/year)	12
Exposure Duration (ED) (years)	40
Conversion Factor (CF) (kg/ug)	1.00E-09
Averaging Time (AT)	(365 days/year) (ED)

Exposure Formula:

Intake= (C)(IR)(CF)(EF)(ED)

(BW)(AT)

Source of RfDs: Integrated Risk Information System (EPA, 1990)

Notes:

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise. K = Analyte Was Present But The Reported Value May Be Biased High; The Actual Value Is Expected To Be Lower.

Table 6-11 NON-CARCINOGENIC RISKS FROM DERMAL ABSORPTION FROM SOILS: MAXIMUM CONCENTRATIONS FROM ALL SITES 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Contaminant	Reference Dose (RfD) (mg/kg/day)	Maximum Concentration (C) (ug/kg)	Average Chronic Daily Intake (mg/kg/day)	Intake/ RfD	Intake Exceeds RfD?	
Arsenic		1200 K	2.40E-08			
Barium	0.05	51900	1.00E-06	2.00E-05	No	
Cadmium	0.0005	620	1.20E-08	2.00E-05	No	
Chromium VI	0.005	8600	1.70E-07	3.00E-05	No	
Lead		14700 K	2.90E-07			
Selenium	0.003	330 J	6.60E-09	2.00E-06	No	
Xylenes	2	600	1.20E-07	6.00E-08	No	
Hazard Index (Sum of Intake/RfD) 7.21E-05						

103	4	
Exposure	Assumptions	

Exposed Individual		Adult Worker
Exposed Skin Area (SA) (sq cm/d	lay)	2940
Skin Adherence Factor (AF) (mg	/sq cm)	1.45
Absorption Factor (ABS)	1% Metals 10%	Organic Compounds
Exposure Frequency (EF) (days/y	year)	12
Exposure Duration (ED) (years)		40
Body Weight (BW) (kg)		70
Averaging Time (AT)		(365 days/year) (ED)
Conversion Factor (CF) (kg/ug)		1.00E-09

Exposure Formula:

Intake = (C)(SA)(AF)(ABS)(EF)(ED)(CF)

(BW)(AT)

Source of RfDs: Integrated Risk Information System (EPA, 1990)

Notes:

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

K = Analyte Was Present But The Reported Value May Be Biased High; The Actual Value Is Expected To Be Lower.

Table 6-12

EXCESS LIFETIME CANCER RISK FROM SOIL INGESTION EXPOSURE AT FANG 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Contaminant	EPA Carcinogen Classification	Carcinogenic Potency Factor (kg-day/mg)	Concentration (C) (ug/kg)	Lifetime Average Chemical Intake (mg/kg/day)	Excess Lifetime Cancer Risk
Arsenic	A	1.5	1200 K	3.20E-09	5.00E-09
Exposure Assump	tions	·			
Exposed Individua	al		Adult Worker		
Soil Intake (IR) (n	ng/day)		0.01		
Body Weight (BW) (kilograms)			70		
Exposure Frequency (EF) (days/year)			12		
Exposure Duration (ED) (years)			40	.	
Conversion Factor (CF) (kg/ug)			1.00E-09		
Averaging Time (AT)	(70 ye	ears) (365 days/year)		
Exposure Formul	a: Intake=	$\frac{(C)(IR)(CF)(EF)(ED)}{(BW)(AT)}$			

Source of Carcinogenic Potency Factors: Integrated Risk Information System (EPA, 1990).

Note:

K = Analyte Was Present But The Reported Value May Be Biased High; The Actual Value Is Expected To Be Lower.

Table 6-13

EXCESS LIFETIME CANCER RISK FROM DERMAL ABSORPTION OF SOILS AT FANG 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Contaminant	EPA Carcinogen Classification	Carcinogenic Potency Factor (kg-day/mg)	Concentration (C) (ug/kg)	Lifetime Average Chemical Intake (mg/kg/day)	Excess Lifetime Cancer Risk
Arsenic	A	1.5	1200 K	1.40E-08	2.00E-08
Exposure Assumptio	ns				
Exposed Individual			Adult Worker		
Exposed Skin Area (SA) (sq cm/day)		2940			
Skin Adherence Factor (AF) (mg/sq cm)		1.45			
Absorption Factor (ABS)		1% Metals 10% Organic Compounds			
Exposure Frequency (EF) (days/year)			12		
Exposure Duration (ED) (years)		40			
Body Weight (BW) (kg)		70			
Averaging Time (AT)		(70) (365 days/year)			
Conversion Factor (CF) (kg/ug)		1.00E-09		
Exposure Formula:		Intake = (C	(SA)(AF)(ABS)(EF)(ED)(CF) (BW)(AT)		

Source of Carcinogenic Potency Factors: Integrated Risk Information System (EPA, 1990).

Note:

K = Analyte Was Present But The Reported Value May Be Biased High; The Actual Value Is Expected To Be Lower.

Table 6-14
COMPARISON OF GROUNDWATER AND SURFACE WATER
MAXIMUM CONCENTRATIONS WITH FEDERAL AMBIENT WATER QUALITY CRITERIA
125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD
JACKSONVILLE, FLORIDA

FAWOC for Protection of **Human Health** Maximum From Ingestion Of Fish (ug/I) Maximum Maximum Groundwater Surface Water Downstream **Toxicity** 10 - 6 Compound Concentration (ug/l) Concentration (ug/l) Concentration (ug/l) Protection Cancer Risk Benzene 60 460 J <1 40 **Ethyl Benzene** 150 3280 140 J <1 39 Toluene 1385 J <1 424000 Xvlenes (total) 430 685 J <1 Methyl-tert-butyl ether 45 99.5 J <1 1,1,1-Trichloroethane 1 1030000 <1 <1 trans-1,2-Dichloroethene 24 <1 <1 Vinyl chloride 4 <1 <1 525 1,2-Dichlorobenzene (o) 34 <1 <1 2600 1,3-Dichlorobenzene (m) 6 <1 <1 2600 1,4-Dichlorobenzene (p) 34 2600 <1 <1 4-Methylphenol 210 <1 <1 Chlorobenzene (mono) 35 <1 <1 15050 1,1-Dichloroethane 13 <1 <1 Napthalene 26 1100 <1 2-Methyl Napthalene 44 155 <1 Arsenic 9.2 4.3 J 1.4 J 0.0175 Barium 574 145 J 40.3 J Cadmium 4.5 17.25 <1.6 <5.5 Chromium (total) 152 90.45 Chromium (hexavalent) Chromium (trivalent) 3433000 Lead 1200 41.5 2.5 B Mercury 0.53 0.68 0.35 0.146 Selenium 1.5 1.1 J <1.1 Silver <4.4 4.7 J <6.7

Note:

J=Estimated. Analyte Was Present But The Reported Value May Not Be Accurate or Precise.

Table 6-15 NON-CARCINOGENIC RISKS FROM POTENTIAL FUTURE GROUNDWATER INGESTION EXPOSURE AT FANG 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Estimated (a) Maximum Reference Dose (RfD) Concentration (C) **Daily Intake** Intake/ Intake Exceeds Contaminant (mg/kg/day) (ug/l) (mg/kg/day) RID RID? Ethyl Benzene 0.1 0.6 J 6.00E-06 6.00E-05 No Naphthalene 0.4 0.36 3.00E-06 8.00E-06 No Toluene 0.3 0.16 2.00E-06 7.00E-06 No **Xylenes** 1.72 2.00E-05 1.00E-05 No 1,1,1-Trichloroethane 0.09 0.004 4.00E-08 4.00E-07 No 1,1-Dichloroethane 6.00E-05 0.009 0.05 J 5.00E-07 No t-1,2-Dichloroethene 0.02 0.1 MJ 9.00E-07 4.00E-05 No 1,2-Dichlorobenzene 0.09 0.14 1.00E-06 1.00E-05 No 1,4-Dichlorobenzene 0.1 0.07 7.00E-07 7.00E-06 No 4-Methyl Phenol 0.5 0.84 8.00E-06 2.00E-05 No Benzoic Acid 5.2 J 5.00E-05 4 1.00E-05 No Chlorobenzene 0.02 0.14 1.00E-06 5.00E-05 No Arsenic 0.04 J 4.00E-07 Barium 0.05 2.00E-05 4.00E-04 2.3 No Cadmium 0.0005 0.02 J 2.00E-07 4.00E-04 No Chromium VI 0.0050.61 6.00E-06 1.00E-03 No 4.8 J 5.00E-05 Mercury (alkyl and inorganic) 0.0003 0.002 J 2.00E-08 7.00E-05 No Selenium 0.003 0.006 J 6.00E-08 2.00E-05 No

Hazard Index (Sum of Intake/RfD) 2.00E-03

Exposure	Assumptions
EVENOVIII C	Washinning

Eyhoam e waamiihnona	
Exposed Individual	Adult Worker
Water Intake (IR) (liters/day)	1
Body Weight (BW) (kilograms)	70
Exposure Duration (ED) (years)	40
Exposure Frequency (EF) (days/year)	240
Averaging Time (AT)	(365 days/year) (ED)
Exposure Formula:	Intake= (C)(IR)(ED)(EF)

Source of RfDs: Integrated Risk Information System (EPA, 1990).

Notes:

(a) = Estimated Concentration For Well Placed In The Deep Aquifer (See Section 6.2).

J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.

M = Total 1,2-Dichloroethene.

(BW)(AT)

Table 6-16 EXCESS LIFETIME CANCER RISK FROM GROUNDWATER INGESTION EXPOSURE AT FANG 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

Contaminant	EPA Carcinogen Classification	Carcinogenic Potency Factor (kg-day/mg)	Estimated (a) Maximum Concentration (C) (ug/l)	Lifetime Average Chemical Intake (mg/kg/day)	Excess Lifetime Cancer Risk
SITE 1		_			
Arsenic	A	1.5	0.04	2E-07	3E-07
Benzene	A	0.029	0.16	9E-07	3E-08
Sum of Risks					3E-07
SITE 2					
Benzene	A	0.029	0.02	1E-07	3E-09
Sum of Risks					3E-09
SITE 3					
Arsenic	A	1.5	0.024	1E-07	2E-07
Benzene	A	0.029	0.14	8E-07	2E-08
1,1-Dichloroethane	C	0.091	0.05	3E-07	3E-08
Sum of Risks					2E-07
SITE 4					
Arsenic	A	1.5	0.021	1E-07	2E-07
Benzene	A	0.029	0.02	1E-07	3E-09
Sum of Risks					2E-07
SITE 5					
Arsenic	A	1.5	0.011	6E-08	9E-08
Benzene	A	0.029	0.24	1E-06	4E-08
Chloromethane	C	0.013	0.004	2E-08	3E-10
Sum of Risks					3E-07
SITE 6					
Arsenic	A	1.5	0.004	2E-08	3E-08
Chloromethane	c	0.013	0.004	2E-08	3E-10
Sum of Risks					3E-08
SITE 8					
Arsenic	A	1.5	0.012	6E-08	1E-07
Benzene	A	0.029	0.104	6E-07	2E-08
Vinyl chloride	A	2.3	0.004	2E-08	5E-08
Sum of Risks					2E-07
Exposure Assumptions				•	
Exposed Individual			Adult Worker		
Water Intake (IR) (liters/	• .		I		
Body Weight (BW) (kilog			70		
Exposure Duration (ED)	•		40		
Exposure Frequency (EF) (days/year)			240		
Averaging Time (AT)			(70) (365 days/year)		
Exposure Formula:		Intake=	(C)(IR)(ED)(EF) (BW)(AT)		

Source of Carcinogenic Potency Factors: Integrated Risk Information System (EPA, 1990).

Notes

- (a) = Estimated Concentration For Well Placed In The Deep Aquifer (See Section 6.2).
- J = Estimated. Analyte Was Present But The Reported Value May Not Be Accurate Or Precise.
- M = Total 1,2-Dichloroethene.

THAT OCCUR OR MAY OCCUR AT JACKSONVILLE INTERNATIONAL AIRPORT, DUVAL COUNTY, FLORIDA ENDANGERED/THREATENED OR POTENTIALLY ENDANGERED/THREATENED PLANTS FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA 125TH FIGHTER INTERCEPTOR GROUP,

			Des	Designated Status	,	Likelihood
Scientific Name	Common Name	FWS ^a	CITES	FDA^{C}	FCREPA ^d	of Occurrence
Cheilanthes microphylla (S.W.) SW.	Southern Lip Fern				~	J
Lilium catesbaei Walter	Pine Lily			T		a .
Osmunda regalis L. var. spectabilis	Royal Fern			ပ		а
Peltandra sagittifolia (Michx.) Morong	Spoon Flower				R	×
Platanthera cristata Michx.	Crested Fringed Orchid		=	Т		Σ
Rhapidophyllum hystrix (Pursh) Wendl and Drude	Needle Palm	URS		ပ	T	Q.
Rhododendron canescens (Michx.) Sweet	Wild Azalea			၁		Ь
Salvinia minima Baker	Water Fern			Τ		щ
Sarracenia minor Walt	Pitcher Plant			H		а
Smilax smallii Morong	Jackson-Vine				T	Σ
Woodwardia areolata (L.) Moore	Netted Chain Fern			T		М

^aU.S. Fish and Wildlife Service, 1988.

^bConvention on International Trade in Endangered Species of Wild Fauna & Flora, 1973.

^CFlorida Department of Agriculture and Consumer Services, 1987 (Lists published in Section 39-27.03-05, FAC).

^dFlorida Committee on Rare and Endangered Plants and Animals (Pritchard, 1978-1979). Hunter/RS&H, 1987-88.

Key:

R = Rare; T = Threatened; C = Commercially Exploited; II = Appendix II species of (CITES).

= Still formally under review for listing, but no longer considered for listing because recent information indicates species is more widespread or abundant than previously URS

= Low; occurrence of an important plant species within or near property boundaries is highly unlikely because of species' range or unsuitable habitat or both. = Moderate; important plant species may occur onsite because range and suitable habitat exist within property boundaries. Σ

= High; there is a very good possibility that an important plant species exists within property boundaries because range and habitat for the species are found onsite.

= Present; the plant species was observed at the site during surveys.

PROTECTED VERTEBRATE SPECIES OBSERVED OR POTENTIALLY OCCURRING ON JACKSONVILLE INTERNATIONAL AIRPORT PROPERTY, DUVAL COUNTY, FLORIDA 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA **Table 6-18**

; ;	ż	Status	qvana	
Scientific Name	Common Name	FGFWFC	FWS	Comments
AMPHIBIANS AND REPTILES				
Alligator mississipiensis	American Alligator	SSC	T(S/A)	Occurs throughout Florida wetlands. Observed in field.
Ambystoma cingulatum	Flatwoods Salamander	1	UR2	May occur in slash pine flatwoods or near cypress swamps located onsite. Not observed during field visit. Unlikely to occur along drainageway.
Drymarchon corais couperi	Eastern Indigo Snake	T	H	May use various habitat types on property. May use gopher tortoise burrows for shelter. Not observed in field.
Gopherus polyphemus	Gopher Tortoise	SSC	UR2	Nineteen active burrows observed in field. No burrows observed in vicinity of drainageway.
Pituophis melanoleucus mugitus	Florida Pine Snake	SSC	UR2	May occur in stands of oak or pine or abandoned fields. Not likely to use property because of lack of pocket gophers, a major food source.

		Status		
Scientific Name	Common Name	FGFWFC ^a	FWS ^b	Comments
Rana areolata	Gopher Frog	SSC	UR2	May use gopher tortoise burrows. Not expected to occur in significant numbers because of scarcity of gopher tortoises.
MAMMALS				
Plecotus rafinesquii	Southeastern Big-Eared Bat	ı	UR2	Prefers heavily forested regions. Will roost in dilapidated buildings and hollow trees. Rare in Florida, unlikely to occur on property.
Sciurus niger shermani	Sherman's Fox Squirrel	SSC	UR2	Observed in field. Potential habitats are suboptimal. Unlikely to use drainageway.
Ursus americanus floridanus	Florida Black Bear	H	UR2	Not observed in field. Not likely to occur because of urbanization and disturbance of habitats.
BIRDS				
Aimophila gestivalis	Bachman's Sparrow	1	UR2	Inhabits open pine or oak woods, palmetto scrub, bushy pastures. Habitat along drainageway unsuitable.

		Status		
Scientific Name	Common Name	FGFWFC	FWSb	Comments
Aramus guarauna	Limpkin	SSC	;	Not expected to use property extensively because of scarcity of apple snails, the major food source.
Dendroica kirtlandii	Kirtland's Warbler	Ш	ш	Migrates along eastern coast of Florida. Unlikely to occur.
Egretta caerulea	Little Blue Heron	SSC	:	May feed in shallow wetlands and drainageway. No rookeries observed.
Egretta thula	Snowy Egret	SSC	į	May feed in wetlands and drainageway. Not likely to nest because of lack of suitable vegetation.
Egretta tricolor	Tri-colored Heron	SSC	;	May occasionally feed in wetlands, although available habitat types are not preferred.
Elanoides forficatus	Swallow-Tailed Kite	;	UR2	May feed in cypress and hardwood swamps. Not observed.
Falco peregrinus tundrius	Arctic Peregrine Falcon	田	L	May hunt in open areas during stopover in winter migration route.
Falco sparverius paulus	Southeastern American Kestrel	H	UR2	May hunt in open areas near roadways and clearings.

(Continued) **Table 6-18**

Status	lame FGFWFC ^a FWS ^b Comments	T E No nests observed on field visit. Not likely to feed in small ponds or drainageway.	k E E May feed in cypress swamps and freshwater marshes. Closest nesting colony located over 10 miles east of property.	SSC Water bodies on property are not expected to support large fish populations necessary for feeding. No nests observed on property.	ded Woodpecker T E Inhabits mature pine flatwoods. No suitable habitat on property.	Warbler E E Property within historic migration
	Common Name	Bald Eagle	Wood Stork	Osprey	Red-Cockaded Woodpecker	Bachman's Warbler
	Scientific Name	Haliaeetus leucocephalus	Mycteria americana	Pandion haliaetus	Picoides borealis	Vermivora bachmanii

 $^{^{\}rm a}{\rm Florida}$ Game and Fresh Water Fish Commission, 1987. $^{\rm b}{\rm U.S.}$ Fish and Wildlife Service, 1987.

Hunter/RS&H, 1988.

Key: T = Threatened; T(S/A) = Threatened by Similarity of Appearance; E = Endangered; SSC = Species of Special Concern; URS = Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking.

Table 6-19 CONSTITUENTS DETECTED IN SURFACE WATERS IN EXCESS OF WATER QUALITY CRITERIA 125TH FIGHTER INTERCEPTOR GROUP, FLORIDA AIR NATIONAL GUARD, JACKSONVILLE, FLORIDA

Constituent	Maximum Concentration (µg/l)	Average Concentration (µg/l)	Class III Surface Water Quality Criteria (µg/l)	Ambient Water Quality Criteria for Freshwater Organisms (µg/l) ^a
Cadmium	21.7	6.3	0.80	1.8 (4-day average, acute value) ^b
				0.66 (4-day average, chronic value) ^b
Chromium	122.0	33.8	50.0	0.29 (1-day average) ^c 120 (4-day average) ^d
Lead	41.9	21.6	30.0	1.3 (4-day average) ^b
Mercury	0.68	0.3	0.20	0.012 (4-day average)

^aU.S. Environmental Protection Agency. Ambient Water Quality Criteria. 1984. ^bMeasured in 1 of 4 samples. ^cHexavalent chromium.

^dTrivalent chromium, hardness of 50 μg/l. Onsite chromium is expected to be in the reduced form.



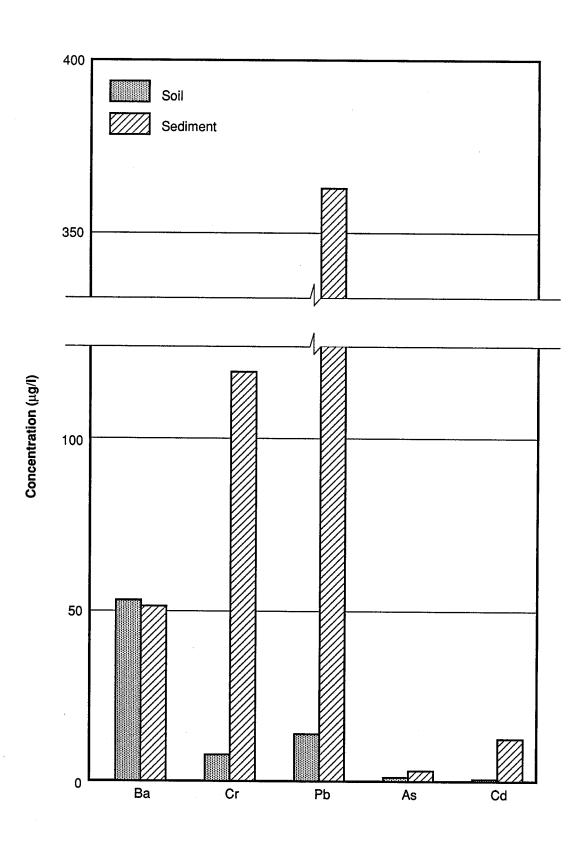


FIGURE 6-1. Comparison of Selected Maximum Contaminant Concentrations for Soil and Sediments, 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Florida.



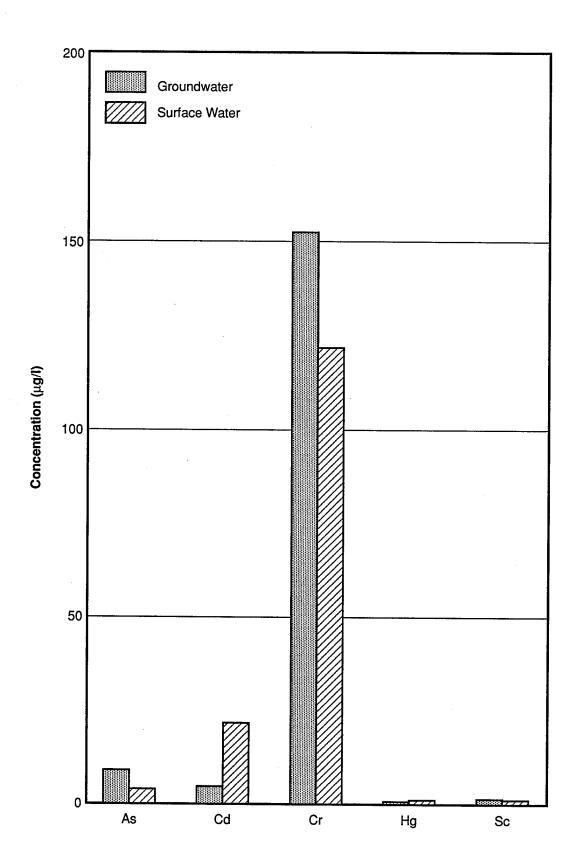


FIGURE 6-2.
Comparison of Selected Maximum Contaminant Concentrations for Groundwater and Surface Water, 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Florida.





FANG property is urbanized, including buildings, paved areas (roads and runways), and mowed grass cover.



Access is restricted. FANG is bordered by wetlands and forested area.

FIGURE 6-3. ® Physical Features, 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Florida.



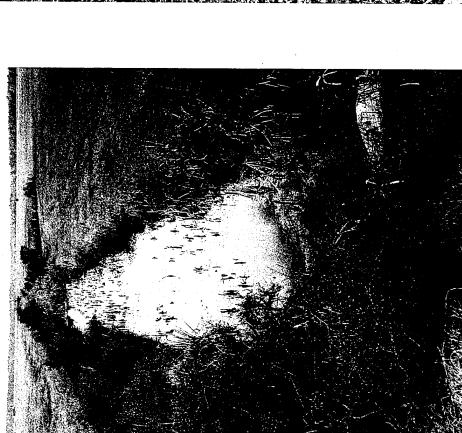


C. The drainageway collects runoff from Jacksonville International Airport, located northeast of FANG.

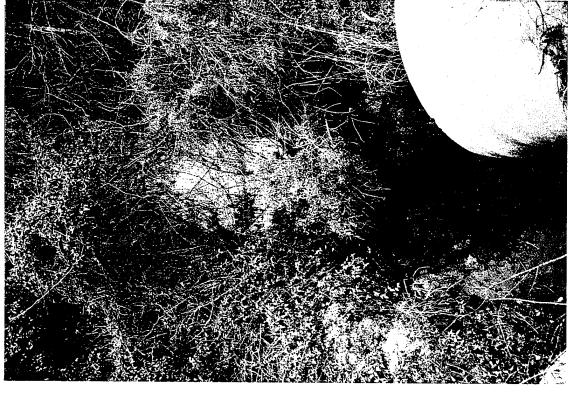


D. The drainageway is inundated with cattails along the entire length, with occurrences of sawgrass, water pennywort, buttonbush, rushes, and mats of filamentous algae.

® **СН**ЯМНІШ



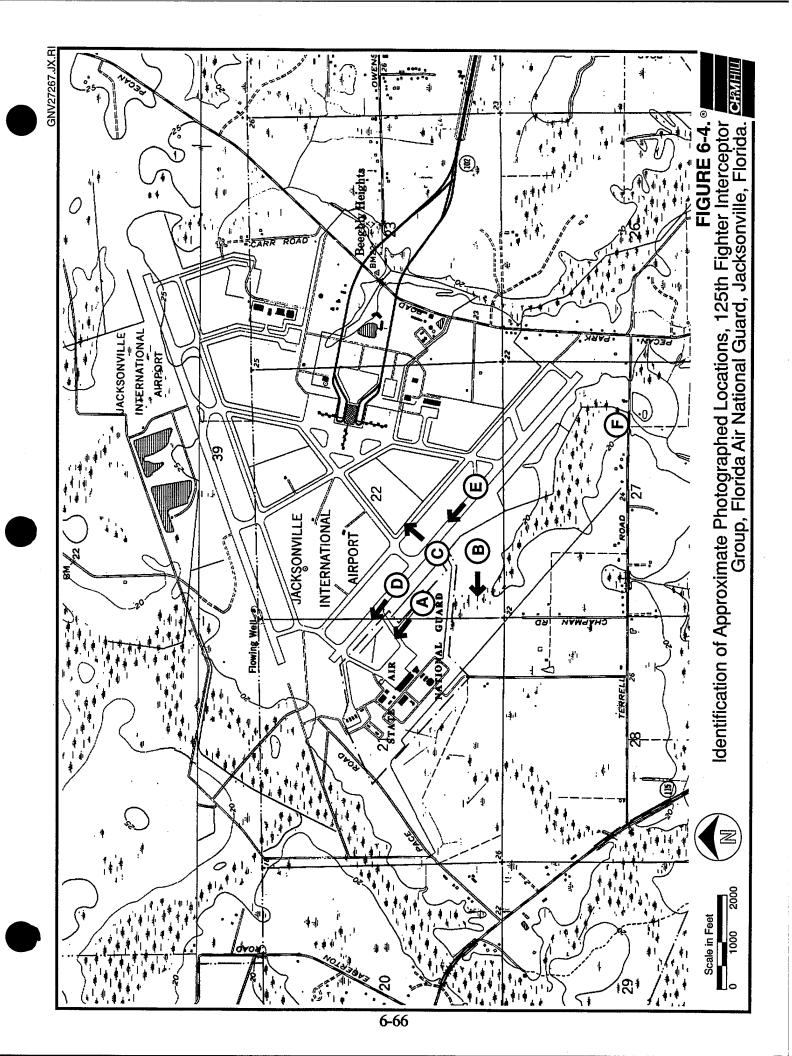
The drainageway varies from 5 to 20 feet in width and from 2 inches to at least 3 feet in depth in downstream pools. This is downstream of the drainage from the airport.

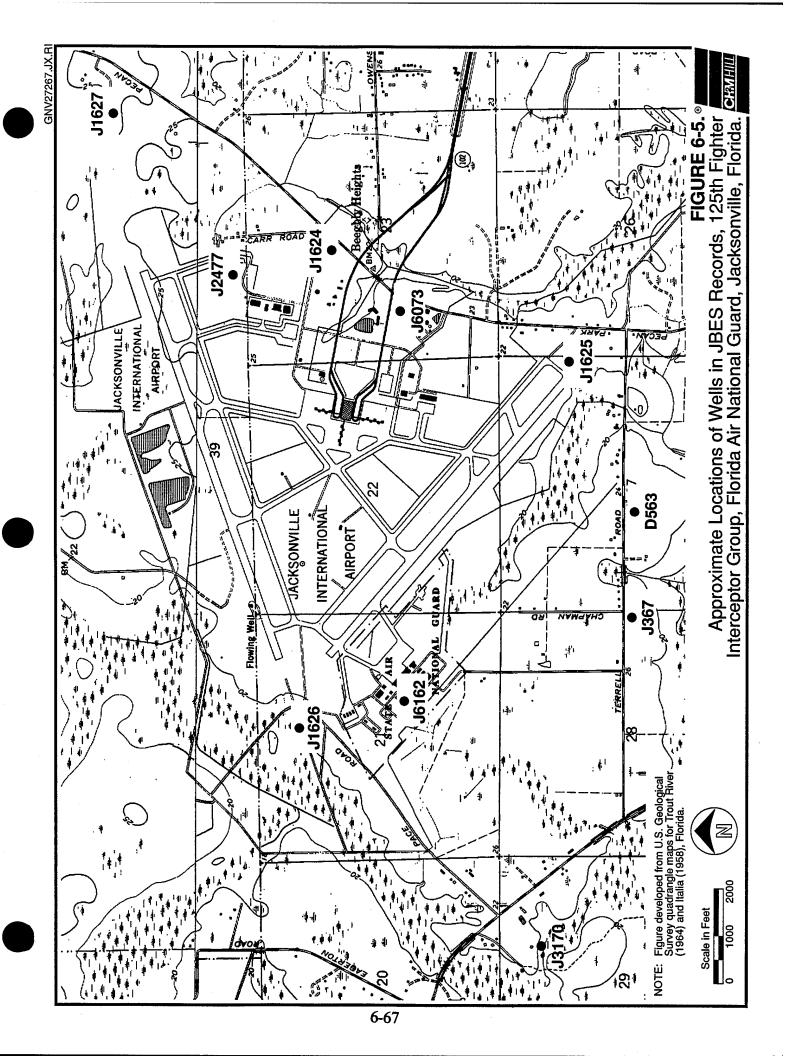


The drainageway discharges to Cedar Creek. Access is possible adjacent to Terrell Road. Extensive recreational use is not anticipated, as the property is owned by the airport.

FIGURE 6-3 (Cont.). CENTILL







SECTION 7
Conclusions

7. CONCLUSIONS

7.1 HYDROGEOLOGY

The shallow groundwater flow at FANG is variable and closely associated with surface drainage patterns. The surficial aquifer materials at the sites to the east (Sites 1, 2, 3E, 3W, 4, 7, and 8) are very fine grained; hydraulic conductivity is about 1 ft/day and groundwater velocity is about 0.0025 to 0.125 ft/day (based on a range of porosity from 0.2 to 0.4). At Sites 5 and 6 on the western side of FANG, the surficial aquifer materials are coarser grained, hydraulic conductivity is on the order of 5 ft/day, and groundwater velocity is about 0.0125 to 1.25 ft/day (based on a range of porosity of 0.2 to 0.4). The hydraulic gradients observed at the sites under both dry and wet conditions were very shallow, on the order of 0.001 to 0.05 ft/ft.

Groundwater flow velocities appear to be slow in the shallow aquifer, with the estimated average velocity ranging from 0.0025 to 0.05 ft/day, so horizontal contaminant transport is also expected to be slow. Contaminant movement is probably mitigated by adsorption of contaminants onto organic matter in the soils. The upward vertical gradient between the shallow unconfined aquifer and deeper confined aquifers is expected to inhibit downward migration of contaminants.

7.2 SOIL CONTAMINATION

As described in Section 1.5, FDER defines soil contamination as existing when OVA readings exceed 500 ppm. Several OVA readings at the eight sites were above that level during the first step of the SI. However, headspace analyses conducted during the second step of the SI with a carbon filter on the OVA indicated that a significant component of the reported concentration was methane gas, which could be the product of naturally occurring organic matter in the soils or low levels of organic contaminants. As a result, no significant soil contamination is believed to exist at any of the sites.

This conclusion is supported by the results of laboratory analyses, which are not required by applicable regulations but were conducted on selected samples to better define possible contaminants. Laboratory analyses detected volatile organics in only one soil sample; a semivolatile organic was found in four soil samples but was also detected in the laboratory QC blank and is a common laboratory contaminant. Some metals were detected in the soil samples at concentrations above those in the background samples.

Based on assumptions about possible worker exposures to soils, the maximum contaminant concentrations at all of the sites indicate non-carcinogenic risks associated with soils are acceptable. The Hazard Index value does not include lead, because information is not currently available from EPA to use in the calculation. However, lead concentrations in soils at the sites are lower than the interim cleanup level.

7.3 GROUNDWATER CONTAMINATION

Laboratory analyses indicate groundwater contamination is present at several of the sites at FANG. The magnitude and extent of groundwater contamination are less than was anticipated from the information obtained from the records search¹; spill volumes may have been overestimated or natural contaminant mitigation processes, such as dilution, evaporation, or biodegradation, may have had some effect.

Data from well point samples may not reflect representative contaminant concentrations in the surficial aquifer, because the well points penetrate only the upper 1 to 2 feet of the saturated zone. However, many of the contaminants detected are lighter than water and would tend to concentrate in the upper portion of the saturated zone. Overall, data from monitor well samples are more representative of ambient concentrations in the surficial aquifer, because the wells are completed to a greater depth in the saturated zone.

7.3.1 Site 1

At Site 1, chromium was detected in excess of the Florida drinking water standard in one well point during the first step of the SI and in the two monitor wells installed at the site during the second step. The source of the contamination is unknown, but it may be related to discharges from jet engines or engine cleaning. Chromium concentrations reported for soil samples from Site 1 were below the background concentration. The volatile organics detected in a single well point at Site 1 during the first step of the SI may indicate localized contamination, as volatile organics were not detected in the monitor wells installed during the second step of the SI.

No current completed groundwater exposure pathways were identified. The reasonable maximum exposure to groundwater contaminants is assumed to potentially occur in a potable well installed in the lower aquifer.

The Hazard Index ranking for Site 1 is less than 1 based on assumptions regarding potential worker exposures to maximum estimated concentrations. This does not include a risk calculation for an estimated lead concentration at the site, because an RfD for lead for use in the Hazard Index method is not available.

The excess lifetime cancer risk for exposure to these estimated contaminant concentrations is 3×10^{-7} at Site 1. This risk is considered low and offsite transport is unlikely, which minimizes the potential for exposure.

7.3.2 Site 2

Four well points at Site 2 showed detectable concentrations of volatile organics during the first step of the SI, and lead was detected in excess of the Florida drinking water standard in three well points. During the second step of the SI, lead was analyzed for in field-filtered and unfiltered samples from two additional well points and concentrations were much lower. No volatile organics were detected in excess of standards.

No current completed groundwater exposure pathways were identified. the reasonable maximum exposure to groundwater contaminants is assumed to potentially occur in a potable well installed in the lower aquifer.

The risk associated with lead at the site could not be calculated because of the lack of an RfD from EPA, but the Hazard Index for estimated concentrations of all other constituents is well below 1. The excess lifetime cancer risk was calculated as 3×10^{-9} .

Any contamination from fuel spills at Site 2 appears to be limited to the area beneath the parking apron. Access to contaminated groundwater is restricted by the concrete parking apron and offsite transport is unlikely, which minimizes the potential for exposure.

7.3.3 Site 3E

At Site 3E, volatile organic constituents were detected in excess of Florida drinking water standards and FDER guidance criteria in WP 3E-6 during the first step of the SI and in MW 3E-1 during the second (the two locations are within 5 feet of each other). Several low concentrations of volatile organic constituents were detected in WP 3E-9 during the first step of the SI but none were detected in MW 3E-2, which was constructed during the second step within 5 feet of the well point. The results indicate that localized contamination is present at Site 3E near MW 3E-1, but the zone of contamination appears to be isolated and may be relatively immobile based on the low permeability of site soils.

No current completed groundwater exposure pathways were identified. The reasonable maximum exposure to groundwater contaminants is assumed to potentially occur in a potable well installed in the lower aquifer.

The risk assessment indicates a Hazard Index of less than 1 and an excess lifetime cancer risk of 2×10^{-7} . These are low risk factors, especially considering the restricted site access and minimal potential for offsite transport of contaminants.

7.3.4 Site 3W

No contaminants were detected in excess of Florida drinking water standards or FDER groundwater guidance criteria at Site 3W.

7.3.5 Site 4

Several low concentrations of volatile organic constituents were detected during the first step of the SI at Site 4, but only the criteria for ethyl benzene was exceeded (in WP 4-1). The potential for transport and/or exposure to contaminants at this site is low and site access is restricted.

No current completed groundwater exposure pathways were identified. The reasonable maximum exposure to groundwater contaminants is assumed to potentially occur in a potable well installed in the lower aquifer.

The Hazard Index is less than 1 and the excess lifetime cancer risk is 2 x 10⁻⁷, which indicates a low risk potential for potential future groundwater exposures.

7.3.6 Site 5

At Site 5, volatile organic constituents in excess of Florida drinking water standards were detected in one well point during the first step of the SI, in one monitor well installed during the second step of the SI, and in two monitor wells installed by others as part of an ongoing UST investigation. Semivolatile organics were not detected in site well points, as would be expected for OWSs receiving fluids associated with vehicle maintenance (e.g., motor oil, brake fluid, or transmission fluid). The absence of semivolatile organics and reported contamination of the UST monitor wells indicate that the underground tank is probably the major source of contamination at Site 5.

No current completed groundwater exposure pathways were identified. The reasonable maximum exposure to groundwater contaminants is assumed to potentially occur in a potable well installed in the lower aquifer.

The Hazard Index for potential groundwater exposure is less than 1 and the excess lifetime cancer risk is 2×10^{-7} . Site access is restricted and offsite transport is unlikely, which makes exposure to contaminants unlikely.

7.3.7 Site 6

Chromium in excess of the Florida primary drinking water standard was detected in five well points and one monitor well installed at Site 6. A comparison of filtered and unfiltered sample results indicates that the chromium is associated with suspended sediments in the groundwater samples.

The Hazard Index for potential groundwater exposure is less than 1 and the excess lifetime cancer risk is 3×10^{-8} . These values do not suggest potential risks for this pathway. However, the hydrogeologic assessment indicates groundwater may be flowing toward a wetland area northwest of the site. Slug test results indicate the aquifer material at this site has a higher permeability than at the other sites. Transport of chromium to the wetland could cause environmental risks to aquatic receptors, although data suggest chromium is present in the less toxic and less mobile trivalent form.

7.3.8 Site 7

No contaminants were detected at Site 7 in excess of Florida drinking water standards or FDER groundwater guidance criteria.

7.3.9 Site 8

At Site 8, volatile organics and naphthalenes were detected in well points installed in the first step of the SI. No contaminants were detected in excess of Florida drinking water standards or groundwater guidance criteria in the three monitor wells installed as part of the second step of the SI, and no volatile or semivolatile organics were found above detection limits. The well points were installed closer to the OWS (the probable source of the contamination) than the monitor wells, so groundwater may be contaminated by organic constituents in a localized area adjacent to the OWS. The soil samples collected during monitor well installation

did not indicate soil contamination that could be a continuing source of local groundwater contamination.

No current completed groundwater exposure pathways were identified. The reasonable maximum exposure to groundwater contaminants is assumed to potentially occur in a potable well installed in the lower aquifer.

The Hazard Index for Site 8 is less than 1 and the excess lifetime cancer risk is 2×10^{-7} . The extent of contamination is limited and offsite transport is unlikely.

7.4 DRAINAGEWAY CONTAMINATION

The only apparent surface connection from a site to the drainageway network is at Site 1, where a surface drainage feature may convey water from the OWS inlet on the west side of Site 1 to Reach 3 (see Attachment 1). Based on the lack of contamination in sediment samples collected at locations between the site and Reach 3, there is no indication that contamination in the drainageways could result from surface water transport from Site 1.

A clear connection was also not established between any of the other sites and the contaminants detected in the surface water and sediment samples taken from the drainageways at FANG. Other potential sources of drainageway contamination include current OWS discharges and runoff from the Jacksonville International Airport.

Cadmium, chromium, lead, and mercury were found in onsite surface waters in excess of Florida standards and could be related to site activities. In the down-stream samples collected in the drainageway near the limits of FANG property, only mercury was detected above Florida Class III surface water criteria. Mercury was not detected consistently in upstream water samples or in any sediment samples, and there is no known source of mercury at any of the sites at FANG.

Several volatile and semivolatile organic constituents were detected in sediment samples, as well as arsenic, barium, cadmium, chromium, and lead above

background levels. No consistent trend in the occurrence of contamination was seen.

The preliminary risk assessment concluded that the restricted access to the onsite drainageways will prevent excess risks to human health from contaminants in the surface water and sediments. Mercury may pose an environmental risk to animals that live or feed in the drainageways because of its tendency to bioaccumulate in the food chain. Alligators and wading birds are the most likely receptors of environmental risks as a result of mercury contamination of drainageway surface water downstream of FANG. The chromium detected above surface water criteria in groundwater from Site 6 could cause environmental risks to aquatic receptors if it migrated to a nearby wetland, although it is expected to be in the less toxic trivalent form.

The sources of the contaminants detected in the drainageway surface water and sediments are not clear. Although past activities at the eight sites may have contributed to drainageway contamination, they are probably not the only sources. Potential sources include current practices at FANG (e.g., OWS discharges) and runoff and stormwater discharges from Jacksonville International Airport.

SECTION 8 Recommendations

8. RECOMMENDATIONS

Recommendations for further action at the eight sites at FANG were developed based on the data gathered during the two steps of the SI, the hydrogeologic assessment, and the preliminary risk assessment. The recommendations are discussed below for each site.

8.1 SITE 1

No further action is recommended at Site 1. Chromium was detected above the Florida drinking water standard, but the shallow aquifer is not currently nor expected to be used for potable water. Site access is restricted, so exposure to contamination is unlikely. Offsite contaminant migration to a water supply well is unlikely, as groundwater from this site probably discharges into drainageway Reach 3. Surface water samples from the drainageway reach showed chromium concentrations well below the Florida drinking water standard. A decision document (DD) recommending no further action will be prepared for this site.

8.2 SITE 2

No further action is recommended at Site 2, as concentrations of volatile organics are low, access is limited (especially beneath the concrete aircraft parking apron), and the potential for migration is low. Floating hydrocarbons were not detected in the well points at the site and volatile organic concentrations are not indicative of a widespread contaminant plume. Past fuel spills, the probable source of the contaminants, are reportedly no longer likely to contribute to groundwater contamination. The groundwater at Site 2 probably moves very slowly and no contact with human or environmental receptors is likely.

The lead concentrations detected in groundwater samples from WP 2-6, 2-9, and 2-10 appear to be a result of the presence of lead in suspended solids. Lead concentrations were low in samples taken from WP 2-12 and 2-13 during the second step of the SI. A DD recommending no further action will be prepared for Site 2.

8.3 SITE 3E

Monitoring only is recommended at Site 3E. Concentrations of 1,1-dichloroethane and benzene detected in the sample from MW 3E-1 exceeded primary drinking water standards. The FDER guidance criteria for ethyl benzene, total xylenes, and total VOAs were also exceeded. However, the volatile organic concentrations detected in MW 3E-1 are not indicative of a widespread contamination problem. The groundwater analyses from surrounding well points and the downgradient monitor well (MW 3E-2) indicate the contamination is limited to a localized area. This is consistent with the soils data gathered at the site, which indicate that the low permeability and the heterogeneity of the soils inhibit movement of shallow groundwater. A DD recommending continued groundwater monitoring of MW 3E-1 will be prepared for this site.

8.4 SITE 3W

No further action is recommended at Site 3W. No organic contaminants were detected in groundwater samples, and lead concentrations were well below Florida standards. A DD recommending no further action will be prepared for this site.

8.5 SITE 4

Several volatile and semivolatile organic constituents were detected in groundwater samples at Site 4, but the only applicable criteria exceeded was for ethyl benzene in WP 4-1. Because concentrations and the potential for exposure and transport are low, a DD recommending no further action will be prepared for this site.

8.6 SITE 5

At Site 5, no further action is recommended related to the OWS and a DD should be prepared. Data gathered from the three well points, the two monitor wells, and the three monitor wells previously installed by others indicate that the major source of the reported groundwater contamination is probably leaking piping associated with the UST. Well point samples did not report semivolatile organics, as would be expected for OWSs receiving fluids associated with vehicle maintenance (e.g., motor oil, brake

fluid, or transmission fluid). The absence of semivolatile organics and the reported contamination of the UST monitor wells indicate the UST system is probably the major source of contamination at Site 5. Further investigation of the UST source is being pursued by FANG.

8.7 SITE 6

Chromium in exceedance of the drinking water standard was detected at Site 6 in unfiltered groundwater samples from five well points and one monitor well. No chromium was detected in filtered samples from two monitor wells and three well points. The chromium detected in groundwater samples appears to be related to the suspended sediments in the samples.

Because the potential source of contamination at Site 6 appears to have been removed and the chromium associated with soils is probably not mobile under current conditions of the shallow aquifer, no further action is recommended at Site 6. A DD recommending no further action will be prepared for this site.

8.8 SITE 7

No further action is recommended at Site 7. No volatile or semivolatile organic constituents were detected in any of the groundwater samples from the seven well points installed at the site. Lead was detected in the groundwater at concentrations well below the Florida standard. Chromium was detected in an unfiltered groundwater sample at a concentration less than the Florida standard. A DD recommending no further action will be prepared for this site.

8.9 SITE 8

No further action is recommended at Site 8. The volatile organics and naphthalenes detected in the well points in the first step of the SI may be indicative of a localized contamination event, possibly OWS spills or leaching from the unlined pit used as an OWS prior to 1981. No volatile or semivolatile organics were detected in the soil or groundwater samples collected from the three monitor wells installed during the second step of the SI at a slightly farther distance from the OWS. The Hazard Index

for potential future exposures to groundwater for Site 8 is less than 1 and the calculated excess lifetime cancer risk is 2×10^{-7} . A DD recommending no further action will be prepared for this site.

REFERENCES

REFERENCES

- 1. Hazardous Materials Technical Center. Installation Restoration Program, Phase I, Records Search, 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville International Airport, Jacksonville, Florida. Report to National Guard Bureau, Washington, D.C. Contract No. DLA 900-82-C-4426. July 1987.
- 2. CH2M HILL. Site Investigation Sampling and Analysis Plan. Site Investigation for 125th Fighter Interceptor Group, Florida Air National Guard. October 1989.
- 3. CH2M HILL. Site Investigation Technical Memorandum. Site Investigation for 125th Fighter Interceptor Group, Florida Air National Guard. September 1989.
- 4. Florida Department of Environmental Regulation. Florida Ground Water Guidance Concentrations. Division of Water Facilities, Bureau of Ground Water Protection. February 1989.
- 5. Leve, G.W. Ground Water in Duval and Nassau Counties, Florida. Florida Geological Survey Report of Investigations No. 43. 1966.
- 6. Fairchild, R.W. *The Shallow-Aquifer System in Duval County, Florida*. U.S. Geological Survey Report of Investigations No. 59. 1972.
- 7. Soil Conservation Service. Soil Survey of City of Jacksonville, Duval County, Florida. In cooperation with University of Florida Institute of Food and Agricultural Sciences and Agricultural Experiment Stations, Soil Science Department. May 1978.
- 8. Bouwer, H. The Bouwer and Rice Slug Test An Update. *Groundwater* 27, 3 (1989): 304-309.
- 9. Reynolds, Smith, and Hill. Jacksonville International Airport Master Plan. 1972.
- 10. U.S. Environmental Protection Agency. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual Part A. July 1989.
- 11. Schaum, J. Risk Analysis of TCDD Contaminated Soil. U.S. Environmental Protection Agency Office of Health and Environmental Assessment. EPA 600/8-84-031. November 1984.

- 12. U.S. Department of the Navy. Airport Noise Control Land Use Compatibility Studies. 1985.
- 13. Eisler, R. Mercury Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. Contaminant Hazard Reviews Report No. 10. Fish and Wildlife Service, U.S. Department of the Interior, Patuxent Wildlife Research Center, Laurel, Maryland. April 1987.
- 14. Eisler, R. Chromium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. Contaminant Hazard Reviews Report No. 6. Fish and Wildlife Service, U.S. Department of the Interior, Patuxent Wildlife Research Center, Laurel, Maryland. January 1986.
- 15. U.S. Environmental Protection Agency. Ambient Water Quality Criteria for Chromium. EPA 440/5-84-029. Office of Water Regulations and Standards, Washington, D.C. 1984.
- 16. U.S. Environmental Protection Agency. Environmental Profiles and Hazard Indices for Constituents of Municipal Sludge. Office of Water Regulations and Standards, Washington, D.C. June 1985.
- 17. U.S. Environmental Protection Agency. Ambient Water Quality Criteria for Chromium. EPA 440/5-84-029. Office of Water Regulations and Standards, Washington, D.C. 1984.
- 18. U.S. Environmental Protection Agency. *Quality Criteria for Water 1986*. EPA 440/5-86-001. Office of Water Regulations and Standards, Washington, D.C. May 1, 1986.
- 19. Eisler, R. Cadmium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. Contaminant Hazard Reviews Report No. 2. Fish and Wildlife Service, U.S. Department of the Interior, Patuxent Wildlife Research Center, Laurel, Maryland. July 1985.
- 20. National Academy of Science. *Drinking Water and Health*, Volume 2. Washington, D.C.: National Academy Press. 1980.
- 21. U.S. Environmental Protection Agency. *Health Advisories for Legionella and Seven Inorganics*. NTIS No. PB87-235586. Office of Drinking Water. March 1987.
- 22. U.S. Environmental Protection Agency. Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites. Office of Waste Programs Enforcement. September 1985.

- 24. U.S. Environmental Protection Agency. Ambient Water Quality Criteria for Lead. EPA 440/5-84-021. Office of Water Regulations and Standards, Washington, D.C. 1984.
- 25. Eisler, R. Lead Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. Contaminant Hazard Reviews Report No. 14. Fish and Wildlife Service, U.S. Department of the Interior, Patuxent Wildlife Research Center, Laurel, Maryland. April 1988.

APPENDIX A NGB/FDER Correspondence



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

October 27, 1989

Captain Lewis Harden
Florida Air National Guard
Headquarters, 125th Fighter
Interceptor Group
P.O. Box 18018
Jacksonville, FL 32229-0018

Dear Captain Harden:

Department personnel have completed the technical review of the Site Investigation for 125th Fighter Interceptor Group, Florida Air National Guard, Site Investigation Technical Memorandum, September 1989. Our recommendations are that:

- 1. Additional sampling and analyses of groundwater at Site 2 for lead and BETX be performed. Filtered and unfiltered samples should be done for lead.
- Groundwater at well points locations 3W-5, 7-2 and 7-5 be sampled and analyzed since the well points were flooded before samples could be obtained.

If you have any questions about this matter, please contact me at 904/488-0190.

Sincerely,

Bric S. Nuzie

Environmental Supervisor II Bureau of Waste Cleanup

ESN/mlr

cc: Satish Kastury
Ashwin Patel/Indar Jagnarine



DEPARTMENTS OF THE ARMY AND THE AIR FORCE

NATIONAL GUARD BUREAU WASHINGTON, D. C. 20310-2500



3 0 NOV 1989

RECEIVED CH2M HILL

DEC 5 1989

Eric S. Nuzie, Environmental Supervisor II Bureau of Waste Cleanup Florida Department of Environmental Regulation Twin Towers Office Building 2600 Blain Stone Road Tallahassee, Florida 32399-2400

MAIL ROOM-GNY

Dear Mr. Nuzie

This is in response to your October 27th comments on the Site Investigation (SI) Technical Memorandum (TM) report for the 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Florida. The field sampling activities have been revised as follows:

- 1. Two wellpoints will be installed at the edge of the parking apron at Site 2. One sample for volatile organics analysis (EPA Method 601/602) will be collected from each wellpoint. One filtered and one unfiltered lead sample will also be collected from each wellpoint. The samples for lead analysis will be filtered in the field using an in-line filter on a peristaltic pump, as specified by the FDER QA staff.
- 2. New wellpoints will be installed at the same approximate locations as the previously installed 3W-5, 7-2, and 7-5 wellpoints. Parameters to be sampled are lead (unfiltered) and EPA Methods 601/602 & 610.

In response to a telecon discussion between Mr. Williams of my staff, Mr. Crane, and yourself on November 22nd, the surficial aquifer will also be sampled to determine the general water quality to demonstrate its potability. Samples collected from monitor wells 1-2 and 3E-1 will be analyzed for total dissolved solids, iron, and hardness in addition to those parameters planned in the SI TM.

The field activities outlined in the SI TM, as modified above, began on November 27th and are scheduled to be completed by December 8th. The results of this field effort as well as the results from screening activities presented in the SI TM will be summarized in the SI Report. This report should be available for your review in the Spring of 1990.

This letter should be attached to and become part of the SI TM.

Please address any questions or comments to Mr. Don Williams of my staff, (301) 981-8159.

Sincerely

GARY L. HINKLE, Chief

Installation Restoration Program Br

Environmental Division

cc: Rebecca L. Swatos/CH2M HILL Carl Wheeler/HAZWRAP

CPT Lewis Harden/FANG



September 5, 1990

GNV27267.JX

Mr. Ashwin Patel Northeast District Florida Department of Environmental Regulation 3426 Bills Road Jacksonville, FL 32207

Dear Ashwin:

Subject: Draft Site Investigation Report, Florida Air National Guard

Enclosed for your review is one copy of the Draft Site Investigation Report for the Florida Air National Guard in Jacksonville. Two copies of the report have also been sent to Eric Nuzie in Tallahassee for his review.

Please send your written comments to Don Williams of the National Guard Support Center within 4 weeks. Mr. Williams will be sending you a letter to request a date for a review meeting to discuss your comments.

Please call me if you have any questions.

Sincerely,

CH2M HILL

Rebecca L. Svatos, P.E.

Project Manager

GNVCR27/085.51

xc: Eric Nuzie/FDER/Tallahassee (2 copies)

Capt. William Norton/FANG (2 copies)

Don Williams/NGB (7 copies)

Steve Fleming/Energy Systems (5 copies)



Florida Department of Environmental Regulation

Twin Towers Office Bidg. © 2600 Blair Stone Read © Tallahassee, Florida 52559-2400 Bob Martines, Governor Dale Twishmann, Secretary John Sheeres, Assistant Recreaty

October 18, 1990

Captain William Morton Florida Air Mational Guard Meadquarters, 125th Fighter Interceptor Group P. G. Mox 12018 Jacksonville, Florida 32229-0018

Dear Captain Morton:

Department personnel have completed the technical review of the Draft Site Investigation Report for 125th Fighter Interdeptor Group, Florida Air National Guard, September 1990. The attached memorandum from Dr. James J. Crane to me documents the Department's concerns. Please note that the comments under Other Comment are based upon available information that the cil/vater separators discharge to the environment. Unless this premise is incorrect, this situation should be corrected to prevent further contemination from these sources.

If I can be of any further assistance with this matter, please contact me at (904) 488-0190.

Sincerely,

Sincerely,

Exic 8. Musle

Exic 8. Musle

rederal Facilities Coordinator

ESW/lb

Inclosure

ss: Ashwin Patel

2946V90



State of Florida DEPARTMENT OF ENVIRONMENTAL REGULATION

For Reading to Build The	
	VILLE
No.	

Interoffice Memorandi

mrio munie, rederal regilities Coordinator, Bureau TOR

of Waste Cleanum

Dr. James J. Crane, Environmental Administrator, FROM

Technical Review Section, Bureau of Waste Cleanup

October 5, 1990 DATE

Draft Site Investigation Report for 128th Fighter SUBJECT: Avant Jannies vir ebisale _____

I've reviewed the subject document and provide these comments for your consideration. The comments are provided on a site-by-site basis.

Site 1. 011/water Separator Inlets Along Airgraft Parking Apron

The assessment and conclusions are satisfactory. The recommendation for no further action appears to be supported by the date, risk assessment and risk management presentations.

fite 2. subsurface of Aircraft Parking Apron

The assessment and conclusions are satisfactory. The recommendation for no further action appears to be supported by the data, risk assessment and risk management presentations.

site 3r. Fire Training Area, Rest

The assessment and conclusions are generally satisfactory, with one. exception. Adetone was reported at 2500 ug/l in WP 32-6. Since My Method 624 was run only on the one well, it is not known way be tound elsewhere on the site at even higher values. It may whether the adetone is testified to that one well or whether it even be a laboratory contaminant, but most blanks were not analyzed by EPA Method 624. This issue should be addressed by resampling Whi-a. If the acetone is confirmed, the other wells and surface water should be sampled and analysed for acetone. These results would then have to be evaluated through the risk assessment process to determine if no further action was an acceptable recommendation at that time.

Site 3W. Fire Training Area, West

The agreement and conclusions are satisfactory. The recommendation for no further action appears to be supported by the data which showed no contamination problem.

Site 4. Oil/Water Separator at Hush House

The assessment and conclusions are satisfactory. The recommendation for no further action appears to be supported by the data; risk assessment and risk management presentations. The oil/water separator (40WB) outfall does appear to be releasing some contaminants as evidenced by the mylene and silver in the water and the mylene in the outfall sediments. This situation should be monitored, and if necessary corrected, before it creates an enforcement problem.

Site 5. Oil/Water Separator at Vehicle Maintenance Building

The assessment and conclusions are satisfactory. The redommendation for the site is appropriate. The UST problem should be investigated and remedied following FDER rules, Chapter 17-761, F.A.C. and Chapter 17-770, F.A.C.

Site 6. Area outside Munitions Building

The assessment and conclusions are satisfactory. The recommendation for no further action except for continued ground water monitoring appears to be appropriate and supported by the date, risk assessment and risk management presentations.

Site 7. Trim Pad for Aircraft Run-Up

The assessment and conclusions are satisfactory. The recommendation for no further action may be supported by the data, risk assessment and risk management presentations. There is one issue to address, though. The surface water at R2C shows a chromium violation of d3.4 ug/l. It appears that site 7 was only sampled for lead. On page 7-3 of the report, it states that chromium may be the result of discharges from jet engines or engine cleaning. Could site 7 be responsible for the violation in Reach 2 downgradient of the site? Perhaps sampling of WP7-1 and WP7-7 would be prudent to address the issue.

Bits E. Aras surrounding Oil/Water Separator at Washrack.

The well points at Site 8 showed significant levels of volatile organics and napthalenes in the ground water, particularly in WPS-3. The monitoring wells showed no similar contamination; however, the surface water and sediments directly downgradient and

through the ground water or by runozi or both.

oil/water separator are apparently moving to the drainageway either directly downgradient of the oil/water separator, except for MAS-3 cownslope show significant levels of volatile organiss.

If the values observed at size 8 were the result of a pest disposal for which the source was terminated, the recommendation for no further action might be supportable. Since the site appears to have a continuing source, some additional work is necessary. A monitoring well directly downgradient of the oil/water separator should be installed and analyzed for volatiles, metals and semiwolatiles.

ecomparpre trap readle to those stress a sering reads and respect to the stress and respect to the stress of the stress and respect to the stress of the stress independent in the stress independent independent

Place explain the dilution rate of 1:230 used for the drinking water risk analysis. You was this number arrived at? Please provide calculations and assumptions used.

Caber Connect

The oil/water separator (OMS) discharges to the environment should be eliminated to avoid any future contamination or any continuous source of contamination. Its sites are generally past disposal sites with problems esemming from practices which now would not be allowed or where proble know better these days. These sites should not still be discharging to the environment. Measures enould be instituted to prevent those discharges.



DEPARTMENTS OF THE ARMY AND THE AIR FORCE

NATIONAL GUARD BUREAU ANDREWS AIR FORCE BASE DC 20331-5008

FEB 7 1991

RECEIVED FEB 15 11 00 AM '91 HAZWRAP

Mr Eric Nuzie, Federal Facilities Coordinator Bureau of Waste Cleanup Florida Department of Environmental Regulation 2600 Blair Stone Road, Twin Towers Office Bldg Tallahassee, Florida 32399-2400

Dear Mr Nuzie

We have received your written comments on the Draft Site Investigation Report for the 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Florida. In general, your comments appear to support our recommendations for no further action at all sites.

Your concern about the oil/water separator discharges to surface ditches or swales has been discussed with Capt_Norton, Base_Civil Engineer, 125th FIG. We have requested him to submit project requirement documentation via AlO6 process to connect the oil/water separators to the sanitary system (POTW) to correct the Clean Water Act violation.

Your comment on the dilution rate used for the drinking water risk analysis has been explained in attachment 1.

The report recommended continued groundwater monitoring for chromium at Site 6, however subsequent resampling at three additional well points confirmed that chromium levels present are within acceptable limits when compared to background values. Based upon this finding, we recommend no further action at this site.

We plan on conducting a meeting on March 25, 1991, to discuss your comments and to determine what actions are required to finalize the SI Report. You are invited to attend this meeting. It is the policy of this office to involve state and local regulatory agencies and to encourage their active participation throughout the IRP process.

Please call Mr Russ Dyer, Project Manager at (301) 981-8149 for the time and place of the meeting and to confirm your attendance.

Sincerely

GARY L. HINKLE, Chief

Installation Restoration Prog Br

Environmental Division

1 Atch: Calculation of Dilution Factor

cc: Mr Steve Fleming/HAZWRAP Capt Bill Norton/125FIG/DE





July 29, 1991

GNV27267.JX.RI

Eric Nuzie
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Eric:

The results of the April 10 sampling at Sites 3E and 7 at the Florida Air National Guard facility in Jacksonville are enclosed along with a technical memorandum summarizing the results of the data validation.

You had requested that a wellpoint be installed and sampled for chromium to evaluate whether groundwater at Site 7 was contributing to the chromium detected in the drainageway near this site. Chromium was not detected in the filtered sample collected from WP 7-8 at Site 7, but was detected at a concentration of 0.042 mg/l in the unfiltered sample. This indicates the chromium is probably related to suspended sediments in the water and is not dissolved chromium which would be likely to migrate to the surface drainageway.

The attached table summarizes the volatile organics data collected from MW 3E-1 and WP 3E-6, which was installed in the same area as MW 3E-1 during the first step of the SI. Monitor well 3E-1 was resampled at your request to evaluate the presence of acetone in the groundwater at the site, as previously detected in WP 3E-6.

Acetone was detected at a concentration of 240 ug/l in the sample collected from MW 3E-1 on April 10, 1991. Acetone was previously detected at that approximate location in WP 3E-6 at a concentration of 2500 ug/l. Benzene, toluene, ethyl benzene, xylene, and 1,1-dichloroethane were also detected in this sample at concentrations similar to those previously detected in MW 3E-1 when it was sampled on December 4, 1989. Cis/trans-1,2-dichloroethene was detected in the sample collected from MW 3E-1 on April 10 and had not previously been detected in MW 3E-1. The detected concentration was similar to that detected in the sample collected from WP 3E-6 on June 15, 1989.

The results from the additional sample collected from MW 3E-1 are similar to those obtained during the second step of the SI except acetone was detected. Acetone was previously detected in WP 3E-6 at a much higher concentration. The organic contaminants detected in this well seem to be present in only an isolated area. No volatile organics were detected in MW 3E-2, downgradient of MW 3E-1, when it was sampled in December 1989 during the second step of the SI. No volatile organics were detected in samples from temporary wellpoints installed on either side of the current location of MW 3E-1 during the second step of the SI in June 1989. Slug testing of MW 3E-1 indicated the groundwater flow in the area is on the order of 1 foot/year so any contaminants present are not likely to migrate very quickly.

CH2M HILL

Erick Nuzie Page 2 July 29, 1991 GNV27267.JX.RI

The additional data enclosed do not change our previous recommendations of no further action at these sites. The chromium detected in the surface drainageway near Site 7 does not appear to be coming from the groundwater near the trim pad. The volatile organics detected in the sample from MW 3E-1 appear to be present in an isolated area and are not likely to migrate quickly. The acetone detected in MW 3E-1 was an order of magnitude less than previously detected and is not at a level likely to be of concern.

Please call me or Russ Dyer by August 16 to discuss finalizing the SI Report based on the enclosed data and the additional data from Site 6 which was previously submitted to you.

Sincerely,

CH2M HILL

Rebecca L. Svatos, P.E.

Project Manager

1001144E.GNV

xc:

Ashwin Patel/FDER/Jacksonville Jim Crane/FDER/Tallahassee John Burrell/Energy Systems

Russ Dyer/NGB
Capt. Youmans/FANG
Bill McElroy/CH2M HILL
Tom Richardson/CH2M HILL

Site 3E Volatile Organic Analysis Data

	WP 3E-6	MW 3E-1	Duplicate MW 3E-1	MW 3E-1
Sample Date	6/15/89	12/4/89	12/4/89	4/10/91
1,1-Dichloroethane	13 J	3.7	4.1	6.3
cis/trans-1,2-Dichloroethene	24MJ	<1	<1	10
Benzene	35	31	36	13
Toluene	13	8.1	8.7	2 J
Chlorobenzene	2	<1	<1	<5
Ethyl Benzene	2 J	26	32	11
Total Xylenes	17	110	130	75
Methylene Chloride	8	NR	NR	<5
Acetone	2500J	NR	NR	240
2-Hexanone	9 J	NR	NR	<10
4-Methyl-2-Pentanone	73	NR	NR	<10

Notes:

M = Total 1,2-Dichloroethene

J = Estimated. Analyte was present but the reported value may not be accurate or precise

TO:

Becky Svastos/GNV

FROM:

Ann Castleberry/MGM

DATE:

June 26, 1991

SUBJECT:

Florida Air National Guard Data Review

PROJECT #:

GNV 27267.JX.RI

1. INTRODUCTION

You asked me to review data from a recent sampling event at Florida Air National Guard. Only water samples were submitted to the laboratory, 3 for volatile organic compound analysis (EPA Method 624) and 3 for chromium (EPA CLP Method). The laboratory provided HAZWRAP Level C data packages for all the analyses and the results were reviewed and validated using the HAZWRAP Guidance (HWP-65). The results of the data review and validation process are summarized below.

2. VOLATILE ORGANIC COMPOUNDS

Per HAZWRAP Guidance, Level C data packages consist of the CLP summary forms and do not include any raw data; therefore, it is impossible to trace back through the analytical process and reprocess any of the calculations. Forms included for review included:

- Form I--Data Summary
- Form II--Surrogate Spike Recovery
- Form III--MS/MSD Recovery
- Form IV--Method Blank Summary
- Form V--GC/MS Tuning and Mass Calibration for BFB
- Form VI--Initial Calibration
- Form VII--Continuing Calibration Check
- Form VIII--Internal Standard Area Summary

The first note in the cover letter indicated that the continuing calibration relative response factor for Vinyl chloride was above the acceptance range. The relative response factors for bromomethane and Chloroethane were also above the acceptance limit of 25.0 percent. However, none of these compounds were detected in the samples and this does not affect the usability of the data.

100113A5.GNV

3. CHROMIUM

Forms included in the data package for review were:

- Form I--Data Summary Report
- Form II--Initial and Continuing Calibration Verification
- Form III--Blanks
- Form IV-MS Spike Sample Recovery
- Form VI--Duplicates
- Form VII--Laboratory Control Sample Results
- Control Chart data

The information in the cover letter indicated that the data was within the CLP acceptance limits. A review of the data package verified this.

4. SUMMARY AND CONCLUSIONS

The data is acceptable for use without any further qualifications.

Pala

100113A5.GNV



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee. Florida 32399-2400 Eawton Chiles. Governor Carol M. Browner, Secretary

August 16, 1991

Mr. Bill McElroy CH₂M Hill Gainesville Office 7201 N.W. 11th Place P.O. Box 1647 Gainesville, FL

Dear Mr. McElroy:

As agreed upon during our March 25, 1991 meeting at the Florida Air National Guard, this letter is to notify you that Department personnel have completed the technical review of information related to Site 6. Based upon site conditions and other pertinent data, specifically the groundwater use in the area and results of the filtered and unfiltered chromium samples, we concur with the recommendation of no further action. If site conditions change or additional information is obtained in the future that indicate that a contamination problem exists, Department personnel will further evaluate the situation and provide technical assistance.

If I can be of any further assistance with this matter, please contact me at (904)488-0190.

Sincerely,

Eric S. Nuzie

Federal Facilities Coordinator

ESN/dd

cc: Brian Cheary



Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Carol M. Browner, Secretary

October 1, 1991

Ms. Rebecca L. Svatos, P.E. CH₂M Hill P.O. Box 1647 Gainesville, FL 32602-1647

Lawton Chiles, Governor

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OCT ?

MAIL ROOM-BING

Dear Ms. Svatos:

Department personnel have completed the evaluation of the additional data for Sites 7 and 3E at Florida Air National Guard, 125th Fighter Interceptor Group. I have enclosed a memorandum from Dr. James J. Crane to me. It documents our comments on this matter.

If I can be of any further assistance, please contact me at (904) 488-0190.

Sincerely,

Eric S. Nuzie

Federal Facilities Coordinator

ESN/dd

Enclosure

cc:

Brian Cheary

Mickey Hartnett Jerry Young Russ Dyer

enltr2.doc



State of Florida DEPARTMENT OF ENVIRONMENTAL REGULATION

	For Routing To Other Than The Addressee
То:	Location:
ъ:	Location:
ъ:	Location:
From:	Date:

Interoffice Memorandum

TO:

Eric Nuzie, Federal Facilities Coordinator, Bureau of Waste

Cleanup

FROM: \mathbb{N} Dr. James J. Crane, Professional Geologist/Technical Review Section Administrator, Bureau of Waste Cleanup

DATE:

September 9, 1991

SUBJECT:

July 29, 1991 Letter from Rebecca L. Svatos to Eric Nuzie,

Florida Air National Guard, 125th Fighter Interceptor Group

- Review

I've reviewed the subject letter and the attached data for Sites 7 and These comments are submitted in response to the letter's conclusions and recommendations.

Apparently a wellpoint, WP7-8 was installed and sampled at Site 7; unfortunately the location of the well point was not provided. that we may be able to approve the no further action recommendation, but not until the location of the sampling point is known.

Also, well MW-3E-1 was sampled and analyzed for acetone and other volatile organics. It appears that the acetone is below the guidance concentration of 700 ppb, thus it does not violate the minimum criteria. The total Benzene (BETX), Toluene, Ethylbenzene and Xylenes was significantly above 50 ppb, i.e., 101 ppb. We consider this level too elevated to agree to no further action. This well should be sampled and analyzed every six months for BETX. If the levels decrease below 50 ppb, a no further action approval would be obtainable. Since it has been almost six months since the last analysis, it may be possible that a current round of sampling and analysis may result in the desired results.

/sr



DEPARTMENT OF THE AIR FORCE

AIR NATIONAL GUARD READINESS CENTER ANDREWS AIR FORCE BASE, DC 20331-6008

APR 1 3 1992

Mr. Eric S. Nuzie Federal Facilities Coordinator Florida Department of Environmental Regulation 2600 Blair Stone Rd. Tallahassee, Florida 32399-2400

Dear Mr. Nuzie

In response to your letter of October 1, 1991 regarding additional information collected at sites 3E and 7, MW-3E-1 was resampled on October 30, 1991. The laboratory data package and the data validation memorandum for the sample, the bailer blank and the trip blank are attached. Also attached is a table summarizing the contaminant concentrations detected in this well in October as well as the historical data.

You requested that MW-3E-1 be resampled because the total Benzene, Toluene, ethylbenzene and xylene (BTEX) concentration in the well was 101 ug/1 when it was sampled on April 10, 1991. The BTEX concentration last October was 87 ug/1, less than the concentration in the April sample, but still greater than the FDER guidance concentration of 50 ug/1. The BTEX concentrations have declined from 175 ug/l in December, 1989 (207 ug/l in the duplicate sample) to the current level of 87 ug/l. Because the preliminary risk assessment did not indicate unacceptable risk levels associated with the higher 1989 BTEX concentrations and considering concentration levels are declining, we request concurrence from FDER that no further action is required at site 3E.

We had failed to provide the location of WP-7-8 when we provided the data on the sample collected from that wellpoint. The wellpoint was installed approximately two feet northwest of where WP-7-7 was located as shown on the attached map. Based on this information we request your concurrence with our recommendation for no further action at site 7.

In your letter dated October 18, 1990, you stated that the recommendations for no further action at sites 1,2,3W,4 and 5 were appropriate. At the March 25, 1991, review meeting for the Draft Site Investigation report, we discussed the data on site 8 and you concurred that no further action was necessary at that site. After reviewing additional data we provided you on site 6, you stated in your letter dated August 16, 1991, that you concurred with our recommendation for no further action at that site.

Following your review of the data attached to this letter, we request your written concurrence that no further action is necessary at any of the eight sites previously discussed under IRP investigation. We anticipate preparing decision documents recommending no further action at the eight IRP sites pending your response.

If you have any questions, please contact Mr. Russell Dyer at ANGRC/CEVR, Building 3500, Andrews AFB, Md 20331-6008, (301) 981-8149.

Sincerely

GARY L. MINKLE, Chief

Installation Restoration Program Br

Environmental Division

4 Atchs

1. Site Maps (3E,7)

2. MW-3E-1 Table

3. Lab Data Package

4. Data Validation Memo

cc: TAG Florida 125th FIG/CC 125th FIG/DE

Florida Air National Guard Monitor Well MW-3E-1 Volatile Organic Data (Concentrations in µg/l)

	Date Sampled					
Volatile Organic Detected	12/4/89	12/4/89 (Duplicate)	4/10/91	10/30/91		
1,1-Dichloroethane cis/trans-1,2-	3.7	4.1	6.3	14		
Dichloroethene	<1	<1	10	17		
Benzene	31	36	13	17		
Toluene	8.1	8.7	2J	17 2J		
Ethyl Benzene	26	32	11			
Total Xylenes	110	130	75	17		
Methylene Chloride	NR	NR	<5	51 5		
Acetone	NR	NR	240	-		
4-Methyl-2-Pentanone	NR	NR	<10	11B 2J		
Total BTEX	175	207	101	21 87		

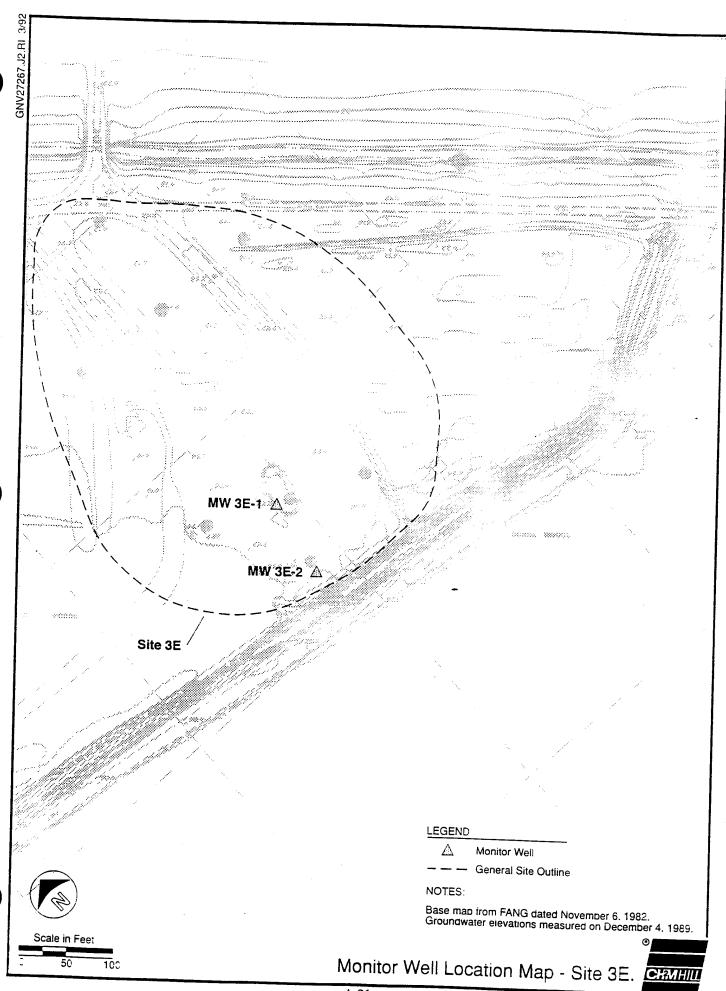
Notes:

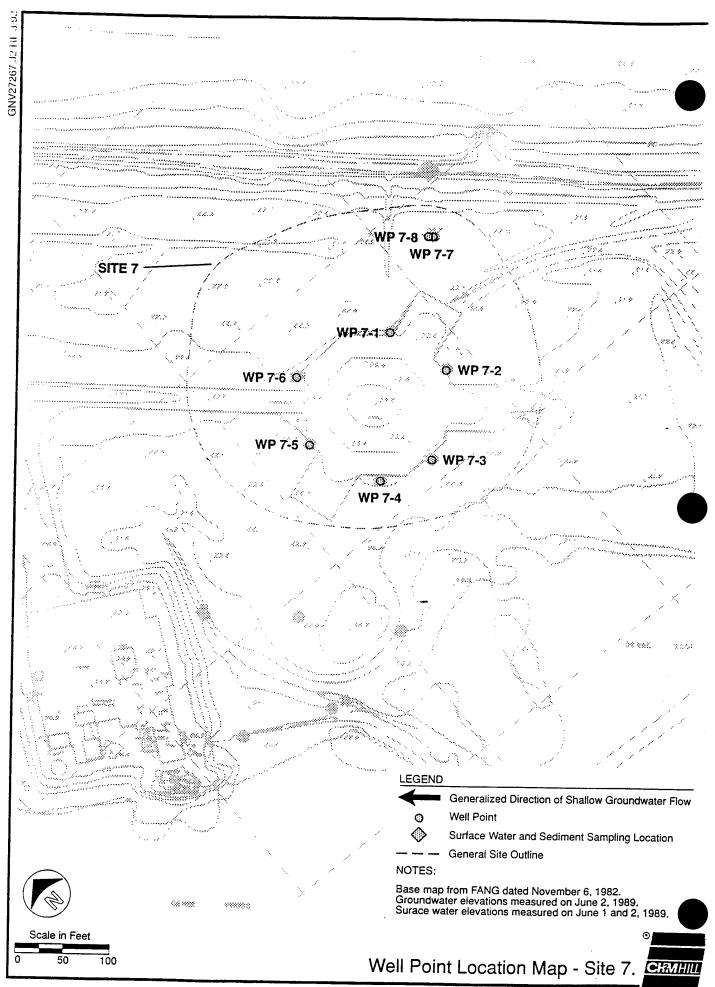
M = Total 1,2-Dichloroethene

J = Estimated; analyte was present but the reported value may not be accurate or precise.

B = Analyte present in associated blank as well as the sample.

BTEX = Sum of benzene, toluene, ethyl benzene, and xylene concentrations.





TO:

Becky Svatos

FROM:

Ann Castleberry

DATE:

January 3, 1992

SUBJECT:

Florida Air National Guard

Data Review

PROJECT: GNV27267.J2

Introduction

On October 30, a single monitoring well was sampled. This groundwater sample, as well as an equipment rinsate blank and a trip blank, was submitted to the CH2M HILL laboratory located in Montgomery, Alabama for HAZWRAP Level C analysis of volatile organic compounds (VOCs).

Level C data package deliverables included:

- Sample results
- Method blank results
- Tuning and mass calibration summary data
- Initial calibration data
- Continuing calibration data
- Surrogate recovery results
- Surrogate recovery control charts
- Internal standard area summary data

The Level C data were reviewed and validated using the guidance presented in the HAZWRAP document, HWP-65, revision 1. Under HAZWRAP Level C, only summary forms, and not all the raw data, are included in the data package.

Holding Time

Holding time is defined as the time in days, from sample collection to sample analysis. The holding time for VOCs is 14 days for an acid-preserved sample. The samples were collected on October 30 and the acid-preserved samples were analyzed on November 10, within the allowable 14 calendar day window.

M E M O R A N D U M Page 2 January 3, 1992

Tuning and Mass Calibration

The CLP SOW establishes tuning and performance criteria in order to ensure mass resolution, identification, and to some degree sensitivity. These criteria are not sample specific; conformance is determined using bromofluorobenzene (BFB) as a standard material. The instrument was tuned correctly when the samples were analyzed.

Calibration

Initial calibration data are used to demonstrate that the analytical instrument is performing satisfactorily and is capable of producing acceptable quantitative data at the beginning of the analytical period. Continuing calibration checks document that the instrument continues to produce acceptable data.

An acceptable five-point initial calibration was performed on October 3, 1991. An acceptable continuing calibration check sample was analyzed immediately before the field samples. Therefore, the calibration data indicate that the analytical instrument was capable of producing acceptable data before the field samples were analyzed.

Internal Standards

Internal standard compounds are used to ensure that instrument sensitivity and response are stable during each analysis and the acceptance criteria are detailed in the 1988 CLP SOW. Each of the samples were spiked with 3 internal standard compounds: bromochloromethane, 1,4-difluorobenzene, and chlorobenzene. The area count for each internal standard was within the acceptance limits for each of the samples.

Surrogate Recovery

Surrogate spike recoveries are used to monitor laboratory performance and to evaluate matrix interference. Surrogate compounds are the structural homologs of target list compounds (TCL), often TCL compounds with deuterium substituted for hydrogen, and are therefore expected to behave in a similar manner to TCL compounds during analysis. Spike recoveries may also be used to estimate accuracy, which is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Surrogate spike recovery acceptance limits are defined by laboratory-specific control charts.

MEMORANDUM

Page 3 January 3, 1992

Each of the samples were spiked with the 3 surrogate compounds; toluene-d8, 1,4-bromofluorobenzene, and 1,2-dichloroethane-d4. The surrogate spike recoveries were all within the laboratory-specific control chart acceptance limits.

Blank Samples

Three types of blank samples were analyzed with the groundwater sample.

- Method Blank--This blank is American Society of Testing and Materials
 (ASTM) Type II water that is treated as a sample in the laboratory; in
 other words, it undergoes the same analytical process as the
 corresponding samples. Method blanks are used to monitor laboratory
 performance and contamination introduced during the analytical
 procedure.
- Equipment Rinsate Blank--After the sampling equipment was decontaminated, it was rinsed with ASTM Type II water, and a sample of this final rinse water was submitted as an equipment rinsate blank. This blank was used to monitor contamination that may have been introduced because of incomplete equipment decontamination.
- Trip Blank--This was used to monitor possible VOC contamination during the sample container trip. This blank consisted of two 40-ml VOC sample containers (one preserved, one unpreserved), that were filled in the analytical laboratory with ASTM Type II water before being sent to the field with the other sample containers. The trip blank containers were not opened in the field and were shipped back to the laboratory with the other field samples.

Only methylene chloride and acetone were detected in the three blank samples as summarized below.

Sample	[methylene chloride]	[acetone]
Method Blank	5 U	9 BJ
Equipment Rinsate Blank	4 J	12 B
Trip Blank	2 J	5 BJ
MW-3E-1	5	11 B

Acetone was present in all the samples at approximately the same concentration. However, methylene chloride was not detected above the method detection limit in the method blank but was present in the other two blank samples. Methylene

MEMORANDUM Page 4 January 3, 1992

chloride was detected in the two field blanks and the groundwater sample at approximately the same concentration. Methylene chloride and acetone are used as extraction solvents in the laboratory; hence, they are common laboratory contaminants. Therefore the acetone and methylene chloride detected in the groundwater sample can be attributed to laboratory contamination.

Results and Conclusions

Seven VOCs were detected in the groundwater sample, MW-3E-1; none of these compounds were detected in any of the 3 corresponding blank samples. This data is acceptable as is and can be used in the decision-making process without further qualification.

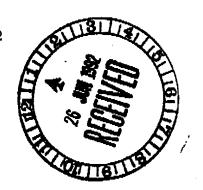


Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400 Lawton Chiles, Governor Carol M. Browner, Secretary

June 15, 1992

MR RUSSELL DYER
DEPARTMENT OF THE AIR FORCE
CODE ANGRC/CERV
BUILDING 3500
ANDREWS AFB MD 20331



Dear Mr. Dyer:

Department personnel have completed the review of the April 13, 1992 letter from Mr. Gary L. Hinkle. The letter concerned environmental issues at the Florida Air National Guard, 125th Fighter Interceptor Group, Jacksonville, Florida. I have enclosed a memorandum addressed to me from Dr. James J. Crane. It documents our comments on this matter.

If I can be of any further assistance, please contact me at (904)488-0190.

sincerely,

Eric S. Nuzie

Federal Facilities Coordinator

ESN/dd

Enclosure

cc: Brian Cheary

Jerry Young



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

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To:		Location:
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Interoffice Memorandum

TO: Eric Nuzie, Federal Facilities Coordinator,

Bureau of Waste Cleanup

FROM: Dr. James J. Crane, Administrator, Technical

Review Section, Bureau of Waste Cleanup

89e

DATE:

June 2, 1992

SUBJECT: April 13, 1992 Letter From Gary L. Hinkle to

Eric Nuzie, Florida Air National Guard, 125th

Fighter Interceptor Group - Review

I've reviewed the subject document and the attached information for Site 3E and Site 7. These comments are submitted in response to the letter's conclusions and recommendations.

In my review comments of a July 29, 1991 information package sent to DER, I'd requested the location of Wellpoint WP7-8 at Site 7. This current information package provides that information. This well was located between the trim pad and the drainageway where an elevated level of chromium was measured. Site 7 does not appear to be a current source of the chromium in the drainage way.

In my September 9, 1991 review comments, I stated that the Total BETX in Well MW-3E-1 was significantly above 50 ppb, i.e., 101 ppb and that this level was too elevated to agree to a no further action. I stated that the well should be maintained in a monitoring only mode in which it would be sampled and analyzed every six months for BETX. If the levels decreased below 50 ppb, a no further action approval would be obtainable.

The current package provides volatile organic data collected on October 30, 1991; the BETX is at 87 ppb, still significantly above 50 ppb. The monitoring only should be continued since no further action is still inappropriate. It has been six months since the last sampling and analysis so the well should be sampled soon.

The other bothersome aspect about this base is that although the individual sites do not seem to be current sources of lead and chromium, elevated levels of these metals in the drainage way sediments and surface waters are a problem. Eric Nuzie June 2, 1992 Page Two

The Draft Site Investigation Report discusses this issue in the conclusions section under the heading of "drainageway contamination". The discussion acknowledges that there is contamination in the drainageways, that there may be some ecological or environmental risks associated to the levels and that the eight sites may have contributed to this contamination in the past. Other bases under their IRP studies have set up a separate study category such as the drainageway system to address through a ecological risk assessment the overall impact of base activities on the ecological systems. Further sampling and analysis of the drainageway sediments and surface water may be necessary; also an attempt should be made to separate the effects of the nearby airport, if possible.

The Installation Restoration Program has designated the Air Force and State and Federal Trustees as responsible for maintaining and protecting the natural resources; thus, these parties may be involved in the overall issue of the base's impacts on the ecosystems.

/sr

AND STREET



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DEPARTMENT OF THE AIR FORCE

AIR NATIONAL GUARD READINESS CENTER ANDREWS AIR FORCE BASE, DC 20331-6008

RECEIVED CH2M MILL

AUG 17 1992

MAIL ROOM-WY

AUG 1 1 1992

Mr. Eric S. Nuzie
Federal Facilities Coordinator
Bureau of Waste Cleanup
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Nuzie

We have reviewed your letter dated June 15, 1992, and Mr. Jim Crane's memo to you dated June 2, 1992. We will resample monitor well MW3E-1 to see if there have been further decreases in the BTEX concentrations, as you requested.

You expressed concern regarding contamination of the surface water and sediments in the drainage ways at the facility. The facility is currently designing a system to reroute all oil/water separator (OWS) discharges from the drainage ways to the waste water system. Implementation of this change should ensure that the facility is not a source of drainage way contamination.

As Mr. Crane mentioned in his comments to you, runoff from the adjacent Jacksonville International Airport is also a likely source of contamination in the drainage ways. It would be difficult to separate this source from other sources when evaluating drainage way data.

We have already shown there is no clear link between the sites at the facility being investigated under the Installation Restoration Program (IRP) and elevated contaminant levels in surface water and sediment samples from the drainage ways. Additional surface water samples could be collected by the facility after the OWS discharges have been rerouted to confirm improvements in surface water quality.

We will resample monitor well MW3E-1, as you requested, but do not feel additional surface water and sediment sampling in the drainage ways would be beneficial. Following your review of this letter, we request your written concurrence that no further action is necessary under the IRP at Sites 1, 2, 3W, 4, 5, 6, 7 and 8. We would be willing to discuss a sampling program for the drainage ways in conjunction with the planned OWS rerouting.

If you should have any additional questions, please contact our Project Manager, Mr. Michael Minior at (301) 981-8155.

Sincerely

RONALD M. WATSON, Chief

Environmental Division

cc: 125 FG CC/DE/EM
HAZWRAP (Mr. White)
CH2M Hill (Ms Svatos)

APPENDIX B Soil Boring Logs



RING NUMBER				
MW 3E-1	SHEET	1	OF	12
	MW 3E-1	MW 3E-1 SHEET	MW 3E-1 SHEET 1	MW 3E-1 SHEET 1 OF

PROJECT	Florida Air National	Guard LOCATION Jacksonville, Florida
ELEVATION_	TOC = 24.05 MSL	
DRILLING M	ETHOD AND EQUIPMENT	HSA, Deep Rock XL-11

WATER	LEVEL A	AND DAT	E _5.5	0 BTOC on 1	2/4/89 START 11/27/89 FINISH 1	1/27/89	LOGGER R. Petersen
§₽.		SAMPLE		STANDARD PENETRATION	SOIL DESCRIPTION		COMMENTS
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	TEST RESULTS 6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
日本 10 一 15 一 15 一	2.5 5.0 8.0	TYP NUM	HEC (FT)	(N)	SAND, dark brown, damp, faint organic odor, fine, loose, (SW-SP) SAND, dark brown to grey brown, wet, medium dense, (SP-SM) SANDY SILT, greyish brown to tan, wet, firm, (SM) SILTY SAND, grey to pale grey, saturated, fine to medium dense, loose, (SM) End of boring	DOT SAW	TESTS AND INSTRUMENTATION
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PROJECT NUMBER	BORING NUMBER				
GNV27267.JX.RI	MW 3E-2	SHEET	2	OF	12
	-1				

PROJECT	Florida Air National	Guard	·····		LOCATION .	Jacksonville,	Florida	
ELEVATION_	TOC = 23.55 MSL	DR	ILLING CON	TRACTORI	Γ Corporati	on, Ocala, Fl	lorida	
DRILLING M	ETHOD AND EQUIPMENT	HSA, Deep Roc	k XL-11					
	EL AND DATE 5.32' BT			11/27/89	FINISH	11/27/89	LOGGER	R. Petersen

WATER	LEVEL A	AND DAT	E _5.3		12/4/89 START 11/27/89 FINISH	11/27/8	9 LOGGER R. Petersen
ă_c		SAMPLE	1	STANDARD PENETRATION	SOIL DESCRIPTION		COMMENTS
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	TEST RESULTS 6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
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-	4.0				SAND, dark brown, damp, fine, loose, (SW-SP)		
5 -	6.0				SILTY SAND, dark brown, wet, soft, (SM)	-	
<u> </u>	9.0				SANDY SILT, dark brown to grey, minor clay, wet, firm, (SP-SC)		
10 -	15.0				SILTY SAND, light grey, saturated, fine to very fine, soft, (SM)		
-			·		End of boring	-	-
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PROJECT NUMBER	BORING NUMBER				
GNV27267.JX.RI	MW 1-1	SHEET	3	OF	12

PROJEC	T_Flo	orida A	ir Natio	onal Guard	LOCATION Jacksonville, Florida							
ELEVATI			24.54 I		DRILLING CONTRACTOR IT Corporation, Ocala, Florida							
					eep Rock XL-11							
WATER	I			9' BTOC on	12/5/89 START 11/27/89 FINISH 1	1/27/89	LOGGER R. Petersen					
FOW FI		SAMPLE	,	STANDARD PENETRATION TEST	SOIL DESCRIPTION	_	COMMENTS					
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION					
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-					medium dense, (SW-SP)	-	<u>*</u>					
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-	6.5					-						
-					SANDY CLAY dark brown, wet clightly	-7///						
-	0.0				SANDY CLAY, dark brown, wet, slightly stiff, (SC)	-////						
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_					SANDY CLAY, light grey, wet, slightly plastic, (SC)	- 1000						
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PROJECT NUMBER	BORING NUMBER				
GNV27267.JX.RI	MW 1-2	SHEET	4	OF	12

PROJECT Florida Air National Guard LOCATION Jacksonville, Florida											
ELEVATION	ONT	OC = 2	22.32 1	MSL	DRILLING CONTRACTOR IT Corporation, Oc	cala, l	Florida				
		OD AND	EQUIPM	IENT HSA, [Peep Rock XL-11						
WATER	LEVEL A	ND DAT	E 1.89	' BTOC on	2/5/89 START 11/27/89 FINISH 11/2	27/89	LOGGER R. Petersen				
%(-		SAMPLE		STANDARD PENETRATION TEST RESULTS	SOIL DESCRIPTION		COMMENTS				
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	RESULTS 6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL					
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PROJECT NUMBER	BORING NUMBER
	

GNV27267.JX.RI MW 5-1

SHEET 5 OF 12

PROJEC	PROJECT Florida Air National Guard LOCATION Jacksonville, Florida												
ELEVAT		OC = 2				RILLING CON	NTRACTOR_						****
				MENT HSA, [xk XL-11							
WATER	LEVEL A	ND DAT	E _4.22	2' BTOC on		_ START	11/28/8	9 FINIS	эн <u>1</u> 1	/28/89	LOGGER _	R. Pete	ersen
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PROJECT NUMBER	BORING NUMBER
GNV27267.JX.RI	MW 5-2

SHEET 6 OF 12

PROJEC	T_FIG	orida Ai	r Natio	onal Guard				LOCATION J	acks	onville	e, Florida	18. 88. 8 1 HALL	
ELEVATI		OC = 2					RACTOR IT	Corporation	on, O	cala,	Florida		
DRILLING	3 METH	OD AND	EQUIPN	MENT HSA, [Deep Rock X	L-11							
				2' BTOC on		TART	11/28/89	_ FINISH	11/2	28/89	LOGGER	R. Peters	en
wo:		SAMPLE		STANDARD PENETRATION TEST		SOIL	DESCRIPTION				(COMMENTS	
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME RELATIVE I STRUCTURI SYMBOL	, COLOR DENSITY E, MINEF	R, MOISTURE C OR CONSISTE RALOGY, USCS	CONTENT, NCY, SOIL GROUP		SYMBOLIC LOG	DEPTH DRILLIN DRILLIN TESTS INSTRU	OF CASING, G RATE, G FLUID LOSS AND MENTATION	S ,
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PROJECT NUMBER BORING NUMBER	R

GNV27267.JX.RI

MW 6-1

SHEET 7 OF 12

PROJECT_	Florida Air National Guard	LOCATION Jacksonville, Florida							
ELEVATION	TOC = 27.98 MSL	DRILLING CONTRACTOR_	IT Corporation, Ocala, Florida						
DRILLING M	ETHOD AND EQUIPMENT HSA, Deep								
	4 001 DTOO 40/4		14 (00 (00	D. Dotoroom					

WATER	LEVEL A	AND DAT	E 4.8	3' BTOC on	12/1/89	_ START	11/28/89	FINISH	_11/	28/89	LOGGER	R. Petersen	
W(-		SAMPLE		STANDARD PENETRATION TEST RESULTS		SOII	L DESCRIPTION	V				COMMENTS	
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL N RELATI STRUC SYMBO	AME, COLO VE DENSIT TURE, MINE OL	PR, MOISTURE Y OR CONSIST ERALOGY, USC	CONTENT, ENCY, SOIL S GROUP		SYMBOLIC LOG	DEPTH DRILLII DRILLII TESTS INSTRU	OF CASING, NG RATE, NG FLUID LOSS, AND JMENTATION	
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PROJECT	NUMBER
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BORING NUMBER

GNV27267.JX.RI

MW 6-2

SHEET 8 OF 12

					SOIL BOI	TING L	JG
PROJECT Florida Air National Guard				onal Guard	LOCATION JE	acksonville	e, Florida
ELEVATI			<u> 25.54</u>		DRILLING CONTRACTOR IT Corporation		
					Deep Rock XL-11		
WATER	LEVEL A	AND DAT	E_2.70		12/1/89 START 11/28/89 FINISH	11/28/89	LOGGER R. Petersen
ŏF.	SAMPLE STANDARD PENETRATION TEST		STANDARD PENETRATION	SOIL DESCRIPTION		COMMENTS	
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	TEST RESULTS 6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
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PROJECT NUMBER

BORING NUMBER

GNV27267.JX.RI

MW 8-1

SHEET 9 OF 12

PROJECT Florida Air National Guard		LOCATION Jack	ksonville, Florida	
ELEVATION TOC = 23.86 MSL DRILLING	G CONTRACTOR IT			
DRILLING METHOD AND EQUIPMENT HSA, Deep Rock XL	<u>11</u>			
0.0FLDT00 40/F/00	44/00/00			· · · · · · · · · · · · · · · · ·

WATER LEVEL AND DATE 2.05' BTOC on 12/5/89 START 11/28/89 FINISH 11/28/89 LOGGER R. Peterser							
Meri	SAMPLE			STANDARD PENETRATION TEST	SOIL DESCRIPTION		COMMENTS
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
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_	3.0	SS-1	1.5	11-10-10-9 (20)	SAND, dark brown, damp, fine to medium dense, (SW-SP)	-	- -
5 -	5.0	SS-2	1.2	7-6-4-4 (10)	SILTY SAND, tan to light grey, wet, loose, (SM)	- -	-
-	7.0				SILTY SAND, tan to light grey, wet, loose, (SM)	_	
10 -	11.0				SANDY CLAY, dark grey, plastic, wet, firm, (SC)		- - -
-	15.0				SILTY SAND, light grey, wet, soft, (SP-SM)		-
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PROJECT NUMBER	BORING NUMBER				
GNV27267.JX.RI	MW 8-2	SHEET	10	OF	12

SOIL BORING LOG

			_										
PROJEC		-		nal Guard				LOCATION J					
ELEVATI		OC = 2					TRACTOR 17	Corporation	on, O	cala,	<u>Florida</u>		
DRILLING	G METH	OD AND	EQUIPM	_{IENT} HSA, [Deep Rock	<u> XL-11</u>							
WATER	LEVEL A	ND DAT	E_2.29	B' BTOC on	12/5/89	START	11/28/89	FINISH	11/2	28/89	LOGGER	R. Petersen	
W ₍ E		SAMPLE		STANDARD PENETRATION		SOIL DESCRIPTION					COMMENTS		
DEPTH BELOW SURFACE (FT)	یہ	9	¥	TEST RESULTS	SOIL NA	AME. COLO	R. MOISTURE	CONTENT.		ပ္	DEPTH	OF CASING,	
FA	H/A	BEH	OVE	6"-6"-6"	RELATIV	E DENSITY	R, MOISTURE OR CONSIST RALOGY, USCS	ENCY, SOIL GROUP		BO	DRILLIN DRILLIN	G RATE, G FLUID LOSS,	
SEP	NTERVAL	TYPE AND NUMBER	RECOVERY (FT)	(N)	SYMBOL					SYMBOLIC	TESTS /	RATE, FLUID LOSS, AND MENTATION	
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PROJECT NUMBER	BORING NUMBER	****			
GNV27267.JX.RI	MW 8-3	SHEET	11	OF	12

SOIL BORING LOG

PROJECT Florida Air National Guard	LOCATION Jacksonville, Florida
ELEVATION TOC = 24.05 MSL	DRILLING CONTRACTORIT Corporation, Ocala, Florida
DRILLING METHOD AND EQUIPMENT HSA, Dec	p Rock XL-11

				8' BTOC on	Deep Rock XL-11 12/5/89 start11/28/89 finish	111	/28/89	LOGGER R. Petersen
W(F		SAMPLE		STANDARD PENETRATION	SOIL DESCRIPTION			COMMENTS
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	TEST RESULTS 6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT RELATIVE DENSITY OR CONSISTENCY, SO STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	r, OIL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
- - -						-		
0 -	1.0							
-	3.0	SS-1	1.5	10-16-14-16 (30)	SAND, brown to dark grey, damp, fin medium dense, (SW-SP)	e to		*
- 5 -	5.0	SS-2	1.4	6-11-8-6 (19)	SAND, light brown to pale grey, wet, to medium dense, (SW-SP)	fine _		_
.]					SAME AS ABOVE, (SW-SP)	-		
-	8.0					-		
10 -					SILTY SAND, greyish blue, trace of c wet, soft, very fine, (SM)	 :lay, - -		
15 -	15.0					-		
-					End of boring	_		
_						-		
-						-		
_			:			_		_
-						-		
4			i			_	,	
-						-		
1						-		



PROJECT NUMBER

BORING NUMBER

GNV27267.JX.RI

SB 8-5

SHEET 12 OF 12

SOIL BORING LOG

PROJEC			ir Natio	onal Guard	LOCATION Ja	acksonvill	e, Florida
ELEVATI		1/A			DRILLING CONTRACTOR IT Corporation	n, Ocala,	Florida
					Deep Rock XL-11		
WATER	LEVEL A	AND DAT	E	N/A	START 11/28/89 FINISH	11/28/89	LOGGER R. Petersen
%(- •		SAMPLE	:	STANDARD PENETRATION TEST	SOIL DESCRIPTION		COMMENTS
DEPTH BELOW SURFACE (FT)	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	TEST RESULTS 6"-6"-6" (N)	SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0	1.0					-	-
-	3.0	SS-1	1.5	9-12-16-14 (28)	SAND, light grey to brown, damp, fine to medium dense, (SW-SP)		Soil boring only. No monitor well installed and no water level measured.
5	5.0	SS-2	1.4	8-9-7-6 (16)	SAME AS ABOVE, (SW-SP)	-	_
· · · · · · · · · · · · · · · · · · ·							

APPENDIX C Cone Penetrometer Test Data

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE FOR FLORIDA AND FLORIDA TYPE SOILS

JOB NAME FLORIDA AIR GAURD CH2MHILL

JOB FILE NUMBER... GNV27267.JX.SI

CONE SOUNDING.... PC1-1

DEPTH FEET		QC G/CH2)	LF (KG/CH2)		N' ES	VERTICAL EFFECTIVE STRESS (KG/CN2)	RELATIVE DENSITY (%)	FRICTION ANGLE (DEGREES)	Youngs Modulus (KG/CM2)	UNDRAINED SHEAR STRENGTH (KG/CM2)	SENSITIVITY	COMP.	GCR
				#			•	##	***	****			
1	SILTY TO CLAYEY F.S.	39.6	.28	13	9	.048	6 0%- 70%) 48	87	-			
2	SILTY TO CLAYEY F.S.	24.4	.13	8	5	.097	50% -6 0%	44- 4 6	53				-
- 3	SENSITIVE FINE GRAINED	6.9	.06	3	2	. 131				. 42	10.7	.02	6
4	SENSITIVE FINE GRAINED	3.1	.03	1	1	. 166		_		.18	8.4	.06	6
5	SOFT CLAY TO MUCK	5.4	.1	3	1	.209				.32	5.4	.04	6
6	CLAYEY FINE SAND	17.5	.22	7	4	. 24	40%-50%	38-40	38				_
7	FINE SAND	105.2	. 24	21	22	.273	70%-80%	46-48	231				_
8	SILTY FINE SAND	65	.11	16	13	. 304	60%-70%	44-46	143				_
9	FINE SAND	77.5	. 13	15	16	. 337	70%-80%	44-46	170				
10	SILTY TO CLAYEY F.S.	28.3	.06	9	6	. 368	40%-50%	38-40	62		***		_
11	FINE SAND	120.1	. 27	24	25	. 401	70%-80%	44-46	264	-	-		
12	SILTY TO CLAYEY F.S.	56.2	.62	18	14	. 432	60%-70%	42-44	123				
13	FINE SAND	91.2	. 41	18	20	. 465	70%-80%	42-44	200	_			
14	SILTY FINE SAND	73. 1	. 58	18	17	. 496	60%-70%	42-44	160				-
15	FINE SAND	113.6		55	24	. 529	707-807	44-46	249			_	
16	FINE SAND	155.2	.75	31	34	. 563	80%-90%	44-46	341				_
17	FINE SAND	124.3	.88	24	28	. 596	70%-80%	44-46	273				_
18	FINE SAND	123	.8	24	28	. 629	70%-80%	42-44	270				
19	FINE SAND	110.9		22	26	. 662	70%-80%	42-44	243		_	-	
20	FINE SAND	124.7		24	28	. 695	70%-80%	42-44	274				
21	FINE SAND	160.8		32	36	.729	80%-90%	44-46	353	-			
22	FINE SAND	122.6	1,2	24	29	.762	70%-80%	42-44	269			'	_
23	FINE SAND	131.7	.92	26	30	. 7 9 5	70%-80%	42-44	289	_			
24	SOFT CLAY TO MUCK	22.5	. 83	15	8	.822				1.31	2.6	UD	6
25	CLAYEY FINE SAND	29.9	.51	11	8	. 853	(40%	34-36	65		_		
26	FINE SAND	94.4	. 56	18	21	. 886	60%-70%	40-42	207			-	
27	SILTY FINE SAND	114	1.68	28	30	.917	601-701	40-42	250				-
28	FINE SAND	144.3		28	33	. 95	70%-80%	42-44	317				_
29	CEMENTED SAND TO HARDPAN			38	49	. 98 7) 90%	44-46	510	_			
30	CEMENTED SAND TO HARDPAN	N 217.9	1	36	48	1.024	80%-90%	44-46	479				_
31	FINE SAND	216.1		43	49	1.057	801-901	44-46	475	_			
35	FINE SAND	113.4		22	25	1.09	50%-70%	40-42	249				
33	FINE SAND	102.3	3 .43	20	55	1.123	50%-60%	40-42	225				
34	FINE SAND	103.3	.59	50	53	1.156	50 %-60%	40-42	227				
35	FINE SAND	124.7		24	28	1.19	60%-70%	40-42	274				
35	FINE SAND	115.2	68	23	26	1.223	60%-70%	40-42	253				
37	SILTY FINE SAND	63.1	. 46	15	14	1.254	40%	36-38	138				
3 8	FINE SAND	117.6	5 .5	23	26	1.287	50 %-6 0%	40-42	258			-	
39	FINE SAND	106.3	.67	21	24	1.32	50%-60%	40-42	233	-			
40	FINE SAND	95.8	. 57	19	21	1.353	40%-50%	38-40	210				

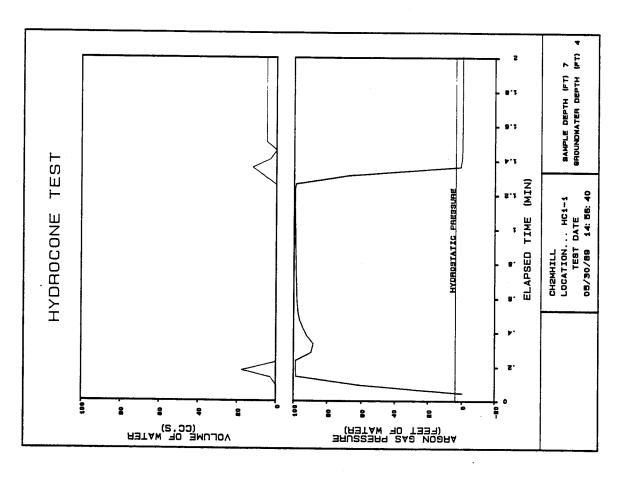
41	SILTY FINE SAND	88/4	.5	55	50	1.384	40%-50%	38-40	194				
42	FINE SAND	123.6	.61	24	27	1.417	50%-60%	40-42	271				
43	SILTY TO CLAYEY F.S.	40.8	. 45	13	10	1.448	(40%	34-36	89		-		
44	SILTY TO CLAYEY F.S.	36. 5	. 12	12	8	1.479	⟨40%	32-34	80				
45	FINE SAND	124.2	.13	24	25	1.512	50%-60%	40-42	273	_			
46	FINE SAND	103.1	.02	20	21	1.545	40%-50%	38-40	226				
47	FINE SAND	129.7	.02	25	26	1.578	50%-60%	40-42	2 85				
48	FINE SAND	94.2	.6	18	21	1.612	40%-50%	38-40	207				
49	FINE SAND	109.5	. 83	21	25	1.645	40%-50%	38-40	240				
50	SILTY FINE SAND	100.5	1.18	25	25	1.676	40%-50%	38-40	221	_		_	
51	FINE SAND	152.3	1.13	30	35	1.709	60%-70%	40-42	3 35			***	
52	SILTY FINE SAND	79.8	.73	19	19	1.74	(40%	36-38	175				
53	SILTY TO CLAYEY F.S.	59. 9	. 85	19	15	1.77	⟨40 %	34-36	131				
54	SILTY FINE SAND	81.3	. 34	20	18	1.801	(40%	36-38	178				
55	FINE SAND	165.5	. 37	33	35	1.834	60%-70%	40-42	364				
56	FINE SAND	124	. 43	24	27	1.867	40%-50%	38-40	2 72	-			
57	FINE SAND	167.5	. 46	33	35	1.301	60%-70%	40-42	368	_			
58	FINE SAND	102.1	. 45	20	22	1.934	40%-50%	36-38	224	_			
59	SILTY VINE SAND	98.3	1.23	24	25	1.965	(40%	36-38	216				
60	CLAYEY FINE SAND	36.1	.93	14	11	1.995	(40≭	30-32	79				
61	SOFT CLAY TO MUCK	21	.82	14	7	2.023	_	-	_	1.07	2.5	UD	3
62	FINE SAND	96	.64	19	22	2.056	(40%	36-38	211				
63	SILTY FINE SAND	74.3	.91	18	19	2.087	⟨ 40 ≭	34-36	163				
64	SILTY TO CLAYEY F.S.	58.6	. 92	19	15	2.118	(40≴	34-36	128				
65	SILTY FINE SAND	91.1	1.25	22	23	2.148	(40%	36-38	200				
66	SILTY FINE SAND	114.1	1.26	28	28	2.179	40%-50%	36-38	251		**		
67	SILTY TO CLAYEY F.S.	66.6	. 85	22	17	2.21	(40%	34-36	146				
68	SILTY TO CLAYEY F.S.	42.2	.3	14	10	2.241	(40%	30-32	92			_	
69	SILTY FINE SAND	47.5	. 18	11	10	2.271	(40%	30-32	104				
70	SILTY FINE SAND	46.8	.17	,11	10	2.302	⟨40%	30-32	102	_			
71	SILTY FINE SAND	46.7	.21	11	10	2.333	(40%	30-32	102				
72	SILTY FINE SAND	44.1	.24	11	10	2.364	(40%	30-32	97				
73	SILTY TO CLAYEY F.S.	39.7	.31	13	9	2.394	(40%	30-32	87				
74	SILTY TO CLAYEY F.S.	39.9	.27	13	9	2.425	(40%	30-32	87				
75	SILTY TO CLAYEY F.S.	33	. 44	11	8	2.456	(40%	(30	72				
76	SILTY FINE SAND	56.8	. 45	14	13	2.487	(40%	32-34	124				
77	SILTY TO CLAYEY F.S.	42	. 66	14	11	2.517	(40%	30-32	92				-
78	FINE SAND	107.6	.77	21	25	2.551	(40%	36-38	236				
73	FINE SAND !	120	. 88	24	28	2.584	40%-50%	36-38	264				
80	SILTY TO CLAYEY F.S.	69.8	1.12	23	18	2.615	(40%	32-34	153				
81	SILTY TO CLAYEY F.S.	60.4	.7	20	15	2.645	(40≭	32-34	132				
82	SILTY TO CLAYEY F.S.	49.5	.52	16	12	2.676	(40%	30-32	108				
83	SILTY FINE SAND	80.6	.72	20	19	2.707	(40%	34-36	177				_
84	SILTY TO CLAYEY F.S.	61.3	. 93	20	16	2.738	(40%	32-34	134				
85 .	SILTY FINE SAND	85.4	1.14	21	22	2.768	(40%	34-36	187				
86	SILTY FINE SAND	96.3	1.06	24	24	2.799	(40%	34-36	211		-		
87	CLAYEY FINE SAND	45. 3	1.07	18	13	2.83	(40%	30-32	99	-		-	_
88	SILTY TO CLAYEY F.S.	25.2	. 13	8	6	2.861	(40%	(30	55				
89	SILTY TO CLAYEY F.S.	37.8	.23	12	8	2.892	(40%	(30	83				_

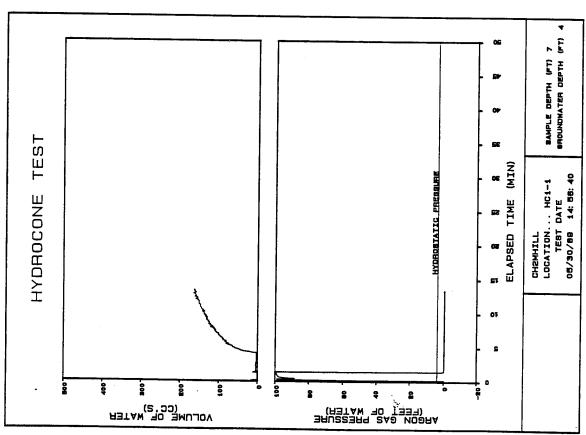
- * N*=POINT STRESS*(.2+.04*FRICTION RATIO)
- * NORMALLY CONSOLIDATED SANDS
- FOR OVERCONSOLIDATED SANDS, SLIGHTLY REDUCE ABOVE FRICTION ANGLES
- *** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
- **** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

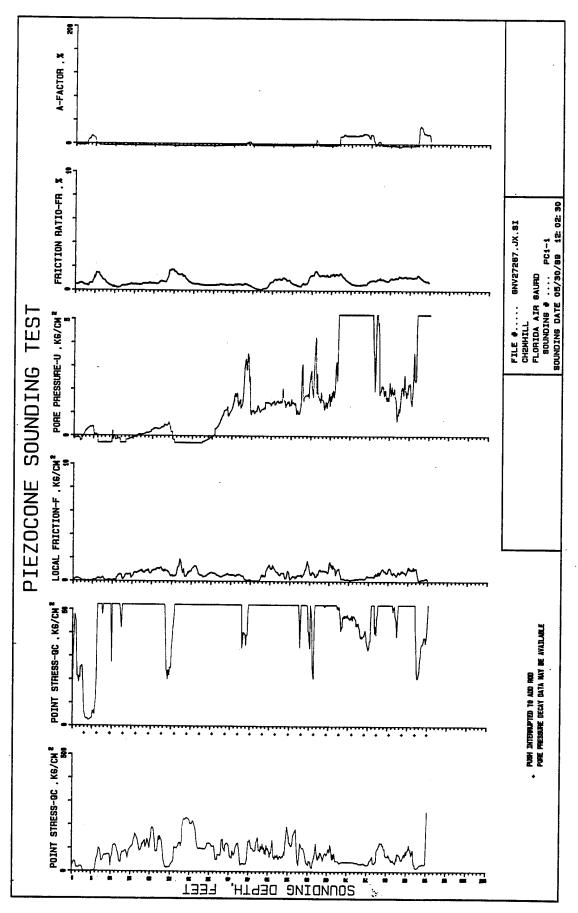
THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBGRTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

SEPTEMBER, 1984

ADDITIONAL LOCAL CORRELATIONS DEVELOPED BY IN-SITU TECHNOLOGY HAVE ALSO BEEN USED IN COMPUTING THE ABOVE DATA. IT IS THE POLICY OF IN-SITU TECHNOLOGY TO CONTINUALLY UPGRADE AND MODIFY C.P.T CORRELATIONS AS PUBLISHED RESEARCH AND LOCAL EXPERIENCE GROWS.







APPENDIX D Slug Test Data and Hydraulic Conductivity Calculations

Florida Air National Guard Step 2 Site Investigation Slug Test Data MW 3E-2

Slug In

Slug Out

	TRANSDUCER READING	ELAPSED TIME	WATER LEVEL CHANGE		TRANSDUCER READING	ELAPSED TIME	WATER LEVEL CHANGE
TIME	(FEET)	(SEC)	(FEET)	TIME	(FEET)	(SEC)	(FEET)
09:00:00 A	H 10.83			09:26:00	AM 11		**********
09:01:00 A	M 10.83			09:27:00	AM 11		
09:01:00 A	M 10.84			09:28:00	AM 11		
09:03:00 A	M 10.85			09:28:00	AM 10.99		
09:03:01 A	M 10.85			09:30:00	AM 10.99		
09:03:02 A	M 11.37			09:30:01	AM 10.97		
09:03:03 A	M 11.43			09:30:02	AM 9.81		
09:03:04 A	M 11.79			09:30:03	AM 9.34	0	1.65
09:03:05 A	M 12.08			09:30:04	AM 9.4	i	1.59
09:03:06 A	M 12.26			09:30:05	AM 9.44	2	1.55
09:03:07 A	M 12.34	0	1.49	09:30:06	AM 9.29	3	1.7
09:03:08 A	M 12.12	1	1.27	09:30:07	AM 9.52	4	1.47
09:03:09 A	M 12.21	2	1.36	09:30:08	AM 9.59	5	1.4
09:03:10 A	M 12.14	3	1.29	09:30:09	AM 9.63	6	1.36
09:03:11 A	M 12.12	4	1.27	09:30:10	AM 9.66	7	1.33
09:03:12 A	M 12.09	5	1.24	09:30:11		8	1.29
09:03:13 A	M 12.25	6	1.4	09:30:12	AM 9.72	9	1.27
09:03:14 A	M 12.09	7	1.24	09:30:13	AM 9.75	10	1.24
09:03:15 A	M 12.02	8	1.17	09:30:14		11	1.22
09:03:16 A	M 11.95	9	1.1	09:30:15		12	1.19
09:03:17 A	M 11.98	10	1.13	09:30:16		13	1.16
09:03:18 A	M 11.94	11	1.09	09:30:17		14	1.15
09:03:19 A	M 11.91	12		09:30:18	AM 9.87	15	1.12
09:03:20 A	M 11.95	13		09:30:19		16	1.09
09:03:21 A		14		09:30:20		17	
09:03:22 A		15		09:30:21		18	1.06
09:03:23 A	M 11.84	16	0.99	09:30:22		19	1.03
09:03:24 A	M 11.85	17		09:30:23		20	1.02
09:03:25 A	M 11.79	18	0.94	09:30:24	AM 9.99	21	1
09:03:26 A	M 11.74	19	0.89	09:30:25	AM 10.01	22	0.98
09:03:27 A	H 11.77	20	0.92	09:30:26	AM 10.03	23	0.96
09:03:28 A	M 11.78	21	0.93	09:30:27		24	0.95
09:03:29 A	H 11.74	22	0.89	09:30:28	AM 10.06	25	0.93
09:03:30 A	M 11.74	23	0.89	09:30:29	AM 10.08	26	0.91
09:03:31 A	M 11.72	24	0.87	09:30:30	AM 10.09	27	0.9
09:03:32 A	M 11.71	25	0.86	09:30:31	AM 10.1	28	0.89
09:03:33 A	M 11.69	26	0.84	09:30:32	AM 10.12	29	0.87
09:03:34 A	M 11.69	27	0.84	09:30:33	AM 10.13	30	0.86
09:03:35 A	M 11.68	28	0.83	09:30:34	AM 10.15	31	0.84
09:03:36 A		29		09:30:35	AM 10.16	32	0.83
09:03:37 A	M 11.65	30	0.8	09:30:36	AM 10.17	33	0.82
09:03:38 A		31	0.86	09:30:37	AM 10.18	34	0.81
09:03:39 A		32		09:30:38		35	0.7 9
09:03:40 A	M 11.54	33	0.69	09:30:39	AH 10.21	36	0.78
09:03:41 A	M 11.66	34	0.81	09:30:40	AM 10.22	37	0.77
09:03:42 A		33		09:30:41		28	0.76
09:03:43 A		36		09:30:42		39	0.75
09:03:44 A		37		09:30:43		40	0.74
09:03:45 /		38		09:30:44		41	0.73
09:03:46 A		39		09:30:45		42	0.72
09:03:47		40		09:30:46		43	0.71
09:03:48		. 41		09:30:47		44	0.71
09:03:49	M 11.55	42	2 0.7	09:30:48	AM 10.29	45	0.7

09:03:50 AM	11.54	43	0.69	09:30:49 AM	10.31	46	0.68
09:03:51 AM	11.54	44	0.69	09:30:50 AM	10.32	47	0.67
09:03:52 AM	11.53	45	0.68	09:30:51 AM	10.32	48	0.67
09:03:53 AM	11.52	46	0.67	09:30:52 AM	10.33	49	0.66
09:03:54 AM	11.51	47	0.66	09:30:53 AM	10.34	50	0.65
09:03:55 AM	11.51	48	0.66	09:30:54 AM	10.35	51	0.64
09:03:56 AM	11.5	49	0.65	09:30:55 AM	10.35	52	0.64
09:03:57 AM	11.5	50	0.65	09:30:56 AM	10.36	53	0.63
09:03:58 AM	11.49	51	0.54	09:30:57 AM	10.37	54	0.62
09:03:59 AM	11.49	52	0.64	09:30:58 AM	10.38	55	0.61
09:04:00 AM	11.48	53	0.63	09:30:59 AM	10.38	56	0.61
09:04:10 AM	11.44	63	0.59	09:31:00 AM	10.39	57	0.6
09:04:20 AM	11.4	73	0.55	09:31:10 AM	10.44	67	0.55
09:04:30 AM	11.37	83	0.52	09:31:20 AM	10.48	77	0.51
09:04:40 AM	11.35	93	0.5	09:31:30 AM	10.52	87	0.47
09:04:50 AM	11.33	103	0.48	09:31:40 AM	10.54	97	0.45
09:05:00 AM	11.32	113	0.47	09:31:50 AM	10.56	107	0.43
09:05:10 AM	11.31	123	0.46	09:32:00 AM	10.58	117	0.41
09:05:20 AM	11.3	133	0.45	09:32:10 AM	10.6	127	0.39
09:05:30 AM	11.29	143	0.44	09:32:20 AM	10.61	137	0.38
09:05:40 AM	11.29	153	0.44	09:32:30 AM	10.61	147	0.38
09:05:50 AM	11.28	163	0.43	09:32:40 AM	10.62	157	0.37
09:06:00 AM	11.27	173	0.42	09:32:50 AM	10.63	167	0.34
09:06:10 AM	11.26	183	0.41	09:33:00 AM	10.64	177	0.35
09:06:20 AM	11.25	193	0.4	09:33:10 AM	10.45	187	0.34
09:06:30 AM	11.25	203	0.4	09:33:20 AM	10.65	197	0.34
09:06:40 AM	11.25	213	0.4	09:33:30 AM	10.66	207	0.33
09:06:50 AM	11.24	223	0.39	09:33:40 AM	10.56	217	0.33
09:07:00 AM	11.23	233	0.38	09:33:50 AM	10.67	227	0.32
09:07:10 AM	11.23	243	0.38	09:34:00 AM	10.67	237	0.32
09:07:20 AM	11.22	25 3	0.37	09:34:10 AM	10.67	247	0.32
09:07:30 AM	11.21	263	0.36	09:34:20 AM	10.67	257	0.32
09:07:40 AM	11.21	273	0.36	09:34:30 AM	10.67	267	0.32
09:07:50 AM	11.2	283	0.35	09:34:40.AM	10.68	277	0.31
09:09:00 AM	11.18	353	0.33	09:34:50 AM	10.68	287	0.31
09:10:00 AM	11.15	413	0.3	09:36:00 AM	10.7	357	0.29
09:11:00 AM	11.13	473	0.28	09:37:00 AM	10.72	417	0.27
09:12:00 AM	11.11	533	0.26	09:38:00 AM	10.73	47 7	0.26
09:13:00 AM	11.09	593	0.24	09:39:00 AM	10.73	537	0.26
09:14:00 AM	11.08	653	0.23	09:40:00 AM	10.74	597	0.25
09:15:00 AM	11.07	713	0.22				
09:16:00 AM	11.05	773	0.2				
09:17:00 AM	11.05	822	0.2				
09:18:00 AM	11.04	893	0.19				
09:19:00 AM	11.04	953	0.19				
09:20:00 AM	11.03	1013	0.18				
09:21:00 AM	11.02	1073	0.17				

11.02

11.02

11.01

11.01

11.01

09:21:00 AM 09:22:00 AM 09:23:00 AM 09:24:00 AM 09:25:00 AM

1073

1133

1193

1253

1313

0.17

0.17

0.16

0.16

0.16

Florida Air Mational Guard Step 2 Site Investigation Slug Test Data MW 1-1

Slug In

Slug Out

	TRANSDUCER READING	ELAPSED Time	WATER LEVEL CHANGE		TRANSDUCER READING	ELAPSED TIME	WATER LEVEL CHANGE
TIME	(FEET)	(SEC)	(FEET)	TIME	(FEET)	(SEC)	(FEET)
10:15:00 AM	12.33			10:38:00	AM 12.34		
10:16:00 AM	12.33			10:38:00			
10:17:00 AM	12.33			10:40:00			
10:18:00 AM	12.33			10:40:01			
10:18:00 AM	12.33			10:40:02		0	2.72
10:20:00 AM	12.33			10:40:03		i	
10:20:01 AM	12.76			10:40:04		2	
10:20:02 AM	13.45			10:40:05		3	
10:20:03 AM	13.75			10:40:06		4	
10:20:04 AM	14.19			10:40:07		5	
10:20:05 AM	13.81			10:40:08		6	
10:20:06 AM	14.13			10:40:09		7	
10:20:07 AM	14.25	0	1.92	10:40:10		8	
10:20:08 AM	14.01	1	1.68	10:40:11		9	
10:20:07 AM	13.94	2		10:40:12		10	
10:20:10 AM	13.91	3		10:40:13		11	
10:20:11 AM	13.45	4	1.32	10:40:14		12	
10:20:12 AM	13.85	5		10:40:15		13	
10:20:13 AM	14.15	6	1.82	10:40:16		14	
10:20:14 AM	13.41	7	1.08	10:40:17		15	
10:20:15 AM	13.78	8	1.45	10:40:18		16	
10:20:16 AM	13.15	9	0.82	10:40:19		17	
10:20:17 AM	13.87	10	1.54	10:40:20		18	
10:20:18 AM	13.82	11		10:40:21		19	
10:20:19 AM	13.76	12		10:40:22		20	
10:20:20 AM	13.72	13		10:40:23		21	
10:20:21 AM	13.69	14	1.36	10:40:24		22	
10:20:22 AM	13.68	15		10:40:25		23	
10:20:23 AM	13.54	16	1.21	10:40:26		24	
10:20:24 AM	13.65	17	1.32	10:40:27		25	
10:20:25 AM	13.63	18	1.3	10:40:28		26	1.41
10:20:26 AM	13.62	19	1.29	10:40:29		27	1.4
10:20:27 AM	13.62	20	1.29	10:40:30		28	1.39
10:20:28 AM	13.6	21	1.27	10:40:31		29	
10:20:29 AM	13.59	22	1.26	10:40:32		30	
10:20:30 AM	13.57	23	1.24	10:40:33		31	1.35
10:20:31 AM	13.56	24	1.23	10:40:34		32	1.35
10:20:32 AM	13.55	25	1.22	10:40:35		33	1.34
10:20:33 AM	13.54	26	1.21	10:40:36		34	1.32
10:20:34 AM	13.53	27	1.2	10:40:37		35	1.31
10:20:35 AM	13.53	28	1.2	10:40:38		36	1.3
10:20:36 AM	13.51	29	1.18	10:40:39		37	1.29
10:20:37 AM	13.49	30	1.16	10:40:40		38	1.28
10:20:38 AM	13.48	31	1.15	10:40:41		39	1.27
10:20:39 AM	13.47	32	1.14	10:40:42		40	1.26
10:20:40 AM	13.45	33	1.12	10:40:43		41	1.25
10:20:41 AM	13.44	34	1.11	10:40:44		42	1.23
10:20:42 AM	13.43	35	1.1	10:40:45		43	1.23
10:20:43 AM	13.42	36	1.09	10:40:46		44	1.22
10:20:44 AM	13.41	37	1.08	10:40:47		45	1.21
10:20:45 AM	13.4	38	1.07	10:40:48		. 46	1.2
10:20:46 AM	13.39	39	1.06	10:40:49		47	1.19
10:20:47 AM	13.38	40	1.05	10:40:50		. 48	1.18
	·= - ·						

10:20:48 AM	13.36	41	1.03	10:40:51 AM	11.17	49	1.17
10:20:49 AM	13.36	42	1.03	10:40:52 AM	11.18	50	1.16
10:20:50 AM	13.35	43	1.02	10:40:53 AM	11.18	51	1.16
10:20:51 AM	13.34	44	1.01	10:40:54 AM	11.19	52	1.15
10:20:52 AM	13.33	45	1	10:40:55 AM	11.2	53	1.14
10:20:53 AM	13.32	46	0.99	10:40:56 AM	11.21	54	1.13
10:20:54 AM	13.31	47	0.98	10:40:57 AM	11.22	55	1.12
10:20:55 AM	13.3	48	0.97	10:40:58 AM	11.23	56	1.11
10:20:56 AM	13.3	49	0.97	10:40:59 AM	11.24	57	1.1
10:20:57 AM	13.29	50	0.96	10:41:00 AM	11.25	58	1.09
10:20:58 AM	13.28	51	0.95	10:41:10 AM	11.32	48	1.02
10:20:59 AM	13.27	52	0.94	10:41:20 AM	11.39	78	0.95
10:21:00 AM	13.26	53	0.93	10:41:30 AM	11.46	88	0.88
10:21:10 AM	13.18	43	0.85	10:41:40 AM	11.52	98	0.82
10:21:20 AM	13.1	73	0.77	10:41:50 AM	11.57	108	0.77
10:21:30 AM	13.04	83	0.71	10:42:00 AM	11.62	118	0.72
10:21:40 AM	12.98	93	0.65	10:42:10 AM	11.66	128	0.68
10:21:50 AM	12.93	103	0.6	10:42:20 AM	11.7	138	0.64
10:22:00 AM	12.89	113	0.54	10:42:30 AM	11.74	148	0.6
10:22:10 AM	12.84	123	0.51	10:42:40 AM	11.77	158	0.57
10:22:20 AM	12.8	133	0.47	10:42:50 AM	11.81	168	0.53
10:22:30 AM	12.77	143	0.44	10:43:00 AM	11.83	178	0.51
10:22:40 AM	12.73	153	0.4	10:43:10 AM	11.86	188	0.48
10:22:50 AM	12.71	163	0.38	10:43:20 AM	11.89	198	0.45
10:23:00 AM	12.68	173	0.35	10:43:30 AM	11.9	208	0.44
10:23:10 AM	12.45	183	0.32	10:43:40 AM	11.93	218	0.41
10:23:20 AM	12.63	193	0.3	10:43:50 AM	11.95	228	0.39
10:23:30 AM	12.6	200	0.27	10:44:00 AM	11.96	238	0.38
10:23:40 AM	12.59	213	0.26	10:44:10 AM	11.98	248	0.36
10:23:50 AM	12.57	223	0.24	10:44:20 AM	12	258	0.34
10:24:00 AM	12.55	233	0.22	10:44:30 AM	12.01	268	0.33
10:24:10 AM	12.53	243	0.2	10:44:40 AM	12.02	278	0.32
10:24:20 AM	12.53	253	0.2	10:44:50 AM	12.03	288	0.31
10:24:30 AM	12.51	263	0.18	10:46:00 AM	12.1	358	0.24
10:24:40 AM	12.5	273	0.17	10:47:00 AM	12.14	418	0.2
10:24:50 AM	12.49	283	0.16	10:48:00 AM	12.15	478	0.19
10:26:00 AM	12.44	353	0.11	10:49:00 AM	12.17	538	0.17
10:27:00 AM	12.4	413	0.07	10:50:00 AM	12.19	598	0.15
10:28:00 AM	12.39	473	0.06			•	
10:29:00 AM	12.37	533	0.04				
10:30:00 AM	12.36	593	0.03				
10:31:00 AM	12.35	653	0.02				
10:32:00 AM	12.35	713	0.02				

10:33:00 AM

10:34:00 AM

10:35:00 AM 10:36:00 AM

10:37:00 AM

12.34

12.34

12.34

12.34

12.34

773

833

893

953

1013

0.01

0.01

0.01

0.01

0.01

Florida Air National Guard Step 2 Site Investigation Slug Test Data MM 5-2

Slug In

Slug Out

	TRANSDUCER READING	TIME	WATER LEVEL CHANGE		TRANSDUCER READING	ELAPSED Time	WATER LEVEL CHANGE
TIME	(FEET)		(FEET)	TIME		(SEC)	(FEET)
12:42:00 PM		**********		12:53:00	PM 10.31	*****	
02:43:00 AM	10.28			12:53:00			
02:44:00 AM	10.28			12:55:00			
02:44:00 AM	10.28			12:55:01			
02:46:00 AM	10.28			12:55:02			
02:46:01 AM	10.72			12:55:03			
02:46:02 AM	11.32			12:55:04	PM 8.46		
02:46:03 AM	11.43			12:55:05			
12:46:04 PM	11.29			12:55:06		0	1.9
12:46:05 PM	11.22			12:55:07		1	1.78
12:46:06 PM	11.04			12:55:08		2	
12:46:07 PM	11.28			12:55:09		3	
12:46:08 PM	11.33			12:55:10	PM 8.66	4	
12:46:09 PM	11.39			12:55:11		5	1.62
12:46:10 PM	11.76			12:55:12		6	1.58
12:46:11 PM	11.79			12:55:13		7	
12:46:12 PM	11.82	. 0	1.54	12:55:14		8	1.51
12:46:13 PM	11.7	1	1.42	12:55:15		9	
12:46:14 PM	11.71	2	1.43	12:55:16		10	1.45
12:46:15 PM	11.55	3		12:55:17	PM 8.89	11	1.42
12:46:16 PM	11.59	4	1.31	12:55:18			1.39
12:46:17 PM	11.33	5	1.05	12:55:19		13	1.37
12:46:18 PM	11.43	6		12:55:20		14	1.34
12:46:19 PM	11.42	7		12:55:21		15	1.31
12:46:20 PM	11.45	8		12:55:22		16	1.28
12:46:21 PM	11.35	9		12:55:23		17	1.25
12:46:22 PM	11.34	10	1.06	12:55:24	PM 9.08	18	1.23
12:46:23 PM	11.3	11	1.02	12:55:25	PH 9.1	19	1.21
12:46:24 PM	11.27	12	0.99	12:55:26	PM 9.13	20	1.18
12:46:25 PM	11.25	13	0.97	12:55:27	PM 9.15	21	1.16
12:46:26 PM		14	0.96	12:55:28	PM 9.18	22	1.13
12:46:27 PM		15	0.94	12:55:29	PM 9.2	23	1.11
12:46:28 PM		16		12:55:30	PM 9.22	24	1.09
12:46:29 PM		17		12:55:31	PM 9.24	25	1.07
12:46:30 PM		18		12:55:32	PM 9.26	26	1.05
12:46:31 PM		19		12:55:33		27	1.03
12:46:32 PM		20		12:55:34		28	1.01
12:46:33 PM		21		12:55:35		29	0.99
12:46:34 PM		22		12:55:36		30	0.97
12:46:35 PM		23		12:55:37		31	0.95
12:46:36 PM		24		12:55:38		32	0.93
12:46:37 PM		25		12:55:39		23	0.92
12:46:38 PM		26		12:55:40		- 34	0.9
12:46:39 PM		27		12:55:41		35	0.88
12:46:40 PM		28		12:55:42		36	0.86
12:46:41 PM		29		12:55:43		37	0.85
12:46:42 PM		30		12:55:44		38	0.83
12:46:43 PM		31		12:55:45		39	0.81
12:46:44 PM		32		12:55:46		40	0.79
12:46:45 PM		33		12:55:47		41	0.78
12:46:46 PM		34		12:55:48		42	0.77
12:46:47 PM		35		12:55:49		43	0.75
12:46:48 PM	10.91	36	0.63	12:55:50	PM 9.58	44	0.73

12:46:49 PM	10.89	37	0.61	12:55:51 PM	9.58	45	0.73
12:46:50 PM	10.8	38	0.52	12:55:52 PM	9.6	46	0.71
12:46:51 PM	10.88	39	0.6	12:55:53 PM	9.62	47	0.69
12:46:52 PM	10.87	40	0.59	12:55:54 PM	9.63	48	0.58
12:46:53 PM	10.86	41	0.58	12:55:55 PM	9.64	49	0.47
12:46:54 PM	10.92	42	0.64	12:55:56 PM	9.65	50	0.66
12:46:55 PM	10.75	43	0.47	12:55:57 PM	9.46	51	0.65
12:46:56 PM	10.68	44	0.4	12:55:58 PM	7.68	52	0.43
12:46:57 PM	10.83	45	0.55	12:55:59 PM	9.69	53	0.62
12:46:58 PM	10.91	46	0.53	12:56:00 PM	9.7	54	0.61
12:46:59 PM	10.8	47	0.52	12:56:10 PM	9.81	64	0.5
12:47:00 PM	10.8	48	0.52	12:56:20 PM	9.9	74	0.41
12:47:10 PM	10.71	58	0.43	12:56:30 PM	9.96	84	0.35
12:47:20 PM	10.67	48	0.39	12:56:40 PM	10.02	94	0.29
12:47:30 PM	10.61	78	0.33	12:56:50 PM	10.07	104	0.24
12:47:40 PM	10.55	88	0.27	12:57:00 PM	10.1	114	0.21
12:47:50 PM	10.51	98	0.23	12:57:10 PM	10.16	124	0.15
12:48:00 PM	10.48	108	0.2	12:57:20 PM	10.18	134	0.13
12:48:10 PM	10.45	118	0.17	12:57:30 PM	10.21	144	0.1
12:48:20 PM	10.43	128	0.15	12:57:40 PM	10.22	154	0.09
12:48:30 PM	10.41	138	0.13	12:57:50 PM	10.23	164	0.08
12:48:40 PM	10.4	148	0.12	12:58:00 PM	10.24	174	0.07
12:48:50 PM	10.38	158	0.1	12:58:10 PM	10.25	184	0.06
12:49:00 PM	10.37	168	0.09	12:58:20 PM	10.26	194	0.05
12:49:10 PM	10.36	178	0.08	12:58:30 PM	10.27	204	0.04
12:49:20 PM	10.35	188	0.07	12:58:40 PM	10.28	214	0.03
12:49:30 PM	10.35	198	0.07	12:58:50 PM	10.28	224	0.03
1∠:49:40 PM	10.34	208	0.06	12:59:00 PM	10.28	234	0.03
12:49:50 PM	10.34	218	0.06	12:59:10 PM	10.28	244	0.03
12:50:00 PM	10.33	228	0.05	12:59:20 PM	10.29	254	0.02
12:50:10 PM	10.33	238	0.05	12:59:30 PM	10.29	264	0.02
12:50:20 PM	10.32	248	0.04	12:59:40 PM	10.29	274	0.02
12:50:30 PM	10.32	258	0.04	12:59:50 PM	10.29	284	0.02
12:50:40 PM	10.32	268	0.04			441	4147
12:50:50 PM	10.32	278	0.04				
12:52:00 PM	10.31	348	0.03				
		V 10	4114				

Florida Air National Guard Step 2 Site Investigation Slug Test Data MW 6-1

Slug In

Slug Out

		ANSDUCER EADING	ELAPSED TIME	WATER LEVEL CHANGE	-		TRANSDUCER READING	ELAPSED TIME	WATER LEVEL CHANGE
TIME		(FEET)	(SEC)	(FEET)	TIME		(FEET)	(SEC)	(FEET)
11:40:00	AM	7.15			11:52:00		9.18	*******	
01:41:00	AM	9.15			11:53:00		9.18		
01:42:00	AM	9.17			11:53:00		7.18		
01:43:00	AH	9.15			11:55:00		8.69		
01:43:00		9.15			11:55:01		7.82		
01:45:00	AM	9.82			11:55:02		7.5	0	1.68
01:45:01	AM	9.84			11:55:03		7.66	1	
01:45:02	AM	9.48			11:55:04		7.76	2	
01:45:03	AM	9.72			11:55:05		7.89	3	
01:45:04	AM	9.61			11:55:06		7.96	4	
11:45:05		9.55			11:55:07		8.04	5	
11:45:06		9.53			11:55:08		8.12	6	
11:45:07		7.51			11:55:09		8.19	7	
11:45:08		9.44			11:55:10		8.25	8	
11:45:09		9.52			11:55:11		8.31	-	
11:45:10		9.82			11:55:12		8.37	9	
11:45:11		10.22			11:55:13			10	
11:45:12		10.48	0	1.33	11:55:14		8.43	11	
11:45:13		10.45	1				8.47	12	
11:45:14		9.75	2		11:55:15		8.51	13	
11:45:15		9.91	3		11:55:16		8.55	14	
11:45:16		9.63	4		11:55:17		8.59	15	
11:45:17		7.83 9.83	5		11:55:18		8.62	16	
11:45:18		7.83 9.84	6		11:55:19		8.66	17	
11:45:19		9.75	7		11:55:20		8.69	18	
11:45:20		7.73 9.84	8		11:55:21		8.72	19	
11:45:21		7.0 1 9.76	9		11:55:22		8.75	20	
11:45:22		7.76 9.71			11:55:23		8.77	21	0.41
11:45:23		9.66	10		11:55:24		8.79	22	0.39
11:45:24		9.71	11		11:55:25		8.81	23	0.37
11:45:25		7.71 9.57	12 13		11:55:26		8.83	24	
11:45:26		7.37 9.47			11:55:27		8.85	25	0.33
11:45:27		7. 1 / 9.57	14		11:55:28		8.88	26	0.3
11:45:28		7.57 9.55	. 15		11:55:29		8.88	27	
11:45:29			16		11:55:30		8.9	28	0.28
11:45:30		9.52 9.51	17		11:55:31		8.92	29	0.26
			18		11:55:32		8.93	20	0.25
11:45:31		9.49	19					31	
11:45:32		9.47	20		11:55:34		8.95	32	0.23
11:45:33		9.45	21		11:55:35		8.96	33	0.22
11:45:34		9.44	22		11:55:36		8.97	34	0.21
11:45:35		9.42	23		11:55:37		8.99	35	0.19
11:45:36		9.4	24		11:55:38		9	36	0.18
11:45:37		9.46	. 25		11:55:39		9	37	0.18
11:45:38		9.35	26		11:55:40		9	28	0.18
11:45:39		9.39	27		11:55:41		9.01	39	0.17
11:45:40		9.52	28		11:55:42		9.02	40	0.16
11:45:41		9.35	29		11:55:43		9.03	41	0.15
11:45:42		9.38	30		11:55:44		9.03	42	0.15
11:45:43		9.4	31		11:55:45		9.04	43	0.14
11:45:44		9.34	32		11:55:46		9.05	44	0.13
11:45:45		9.32	33		11:55:47		9.05	45	0.13
11:45:46		9.32	34		11:55:48		9.06	46	0.12
11:45:47	HΠ ,	9.36	35	0.21	11:55:49	AM	9.06	47	0.12

11:45:48 AM	9.32	36	0.17	11:55:50 AM	9.07	48	0.11
11:45:49 AM	9.19	37	0.04	11:55:51 AM	9.07	49	0.11
11:45:50 AM	9.62	38	0.47	11:55:52 AM	9.07	50	0.11
11:45:51 AM	9.46	39	0.31	11:55:53 AM	9.07	51	0.11
11:45:52 AM	9.24	40	0.09	11:55:54 AM	9.08	52	0.1
11:45:53 AM	9.1	41	-0.05	11:55:55 AM	9.08	53	0.1
11:45:54 AM	9.5	42	0.35	11:55:56 AM	9.09	54	0.09
11:45:55 AM	9.3	43	0.15	11:55:57 AM	9.09	55	0.09
11:45:56 AM	9.28	44	0.13	11:55:58 AM	9.09	56	0.09
11:45:57 AM	9.28	45	0.13	11:55:59 AM	9.09	57	0.09
11:45:58 AM	9.27	46	0.12	11:56:00 AM	9.1	58	0.08
11:45:59 AM	9.26	47	0.11	11:56:10 AM	9.12	68	0.06
11:46:00 AM	9.26	48	0.11	11:56:20 AM	9.13	78	0.05
11:46:10 AM	9.23	58	0.08	11:56:30 AM	9.13	88	0.05
11:46:20 AM	9.2	68	0.05	11:56:40 AM	9.13	98	0.05
11:46:30 AM	9.2	78	0.05	11:56:50 AM	9.14	108	0.04
11:46:40 AM	9.19	88	0.04	11:57:00 AM	9.14	118	0.04
11:46:50 AM	9.19	98	0.04	11:57:10 AM	9.14	128	0.04
11:47:00 AM	9.19	108	0.04	11:57:20 AM	9.14	138	0.04
11:47:10 AM	7.18	118	0.03	11:57:30 AM	9.14	.148	0.04
11:47:20 AM	9.18	128	0.03	11:57:40 AM	9.14	158	0.04
11:47:30 AM	9.18	138	0.03	11:57:50 AM	9.15	168	0.03
11:47:40 AM	9.18	148	0.03	11:58:00 AM	9.15	178	0.03
11:47:50 AM	9.18	158	0.03	11:58:10 AM	9.15	188	0.03
11:48:00 AM	9.18	168	0.03	11:58:20 AM	9.15	198	0.03
11:48:10 AM	9.18	178	0.03	11:58:30 AM	9.15	208	0.03
11:48:20 AM	9.18	188	0.03	11:58:40 AM	9.15	218	0.03
11:48:30 AM	9.18	198	0.03	11:58:50 AM	7.15	228	0.03
11:48:40 AM	9.18	208	0.03	11:59:00 AM	9.15	238	0.03
11:48:50 AM	9.18	218	0.03	11:59:10 AM	9.15	248	0.03
11:49:00 AM	9.18	228	0.03	11:59:20 AM	9.15	258	0.03
11:49:10 AM	7.18	238	0.03	11:59:30 AM	9.15	268	0.03
11:49:20 AM	9.18	248	0.03	11:59:40 AM	9.15	278	0.03
11:49:30 AM	7.18	258	0.03	11:59:50 AM	9.15	288	0.03
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11:49:50 AM	7.18	278	0.03				
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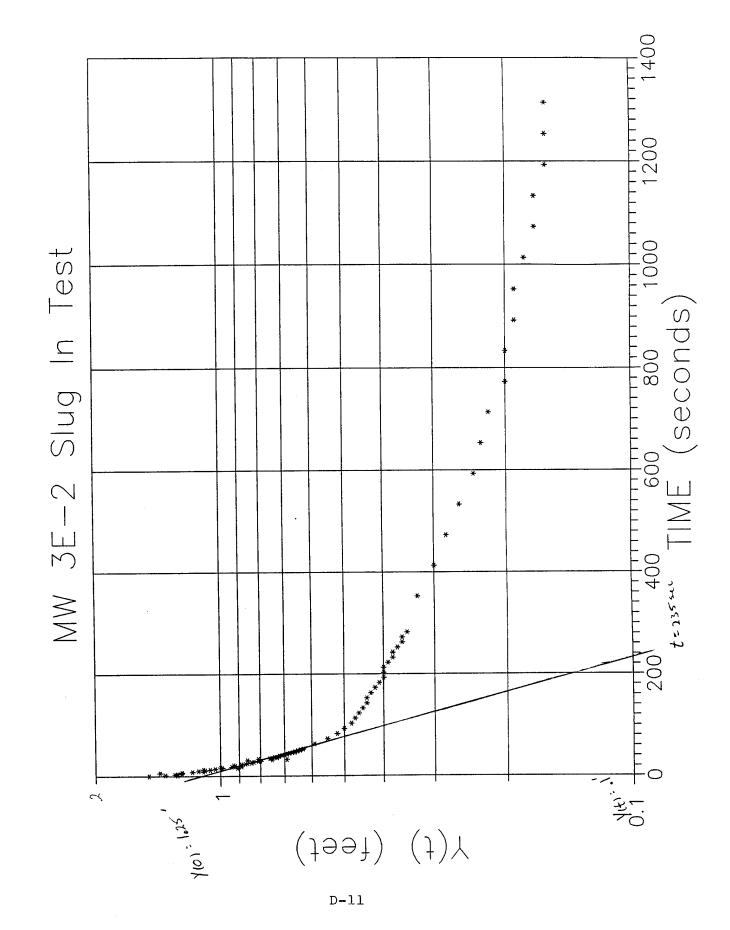
Florida Air National Guard Step 2 Site Investigation Slug Test Data MM 8-1

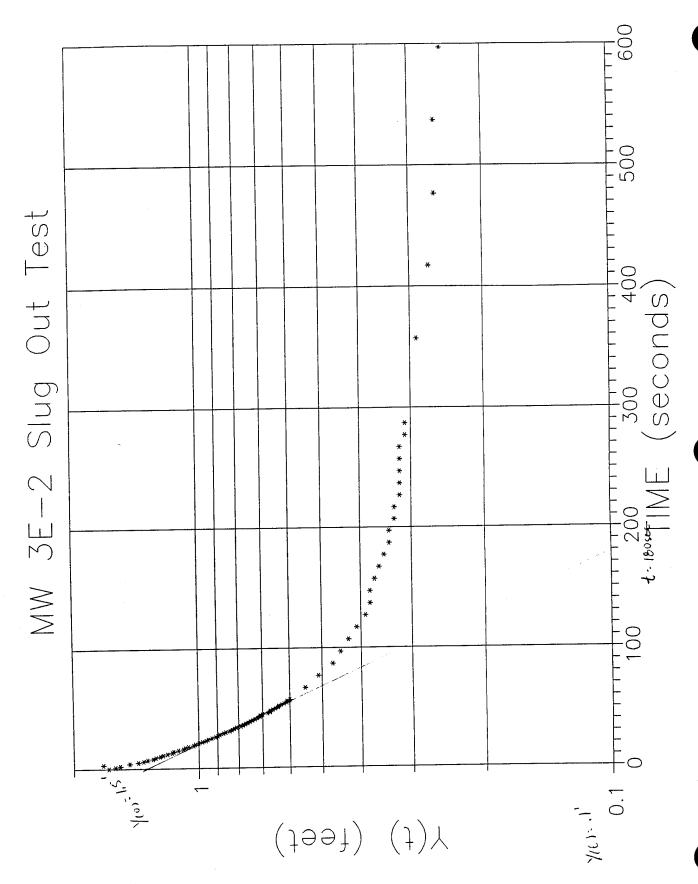
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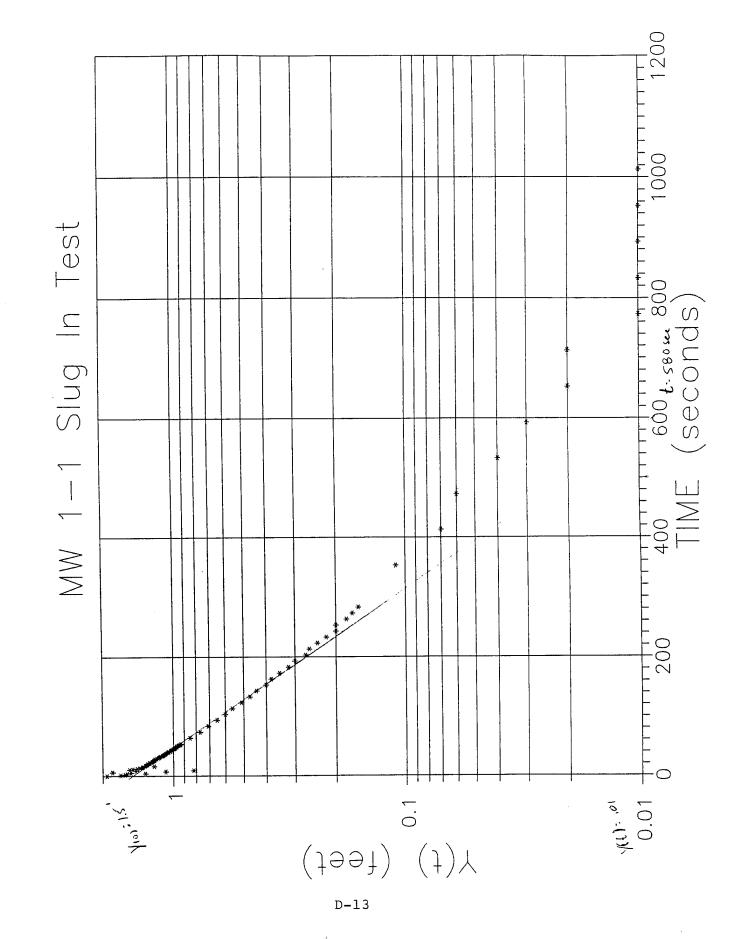
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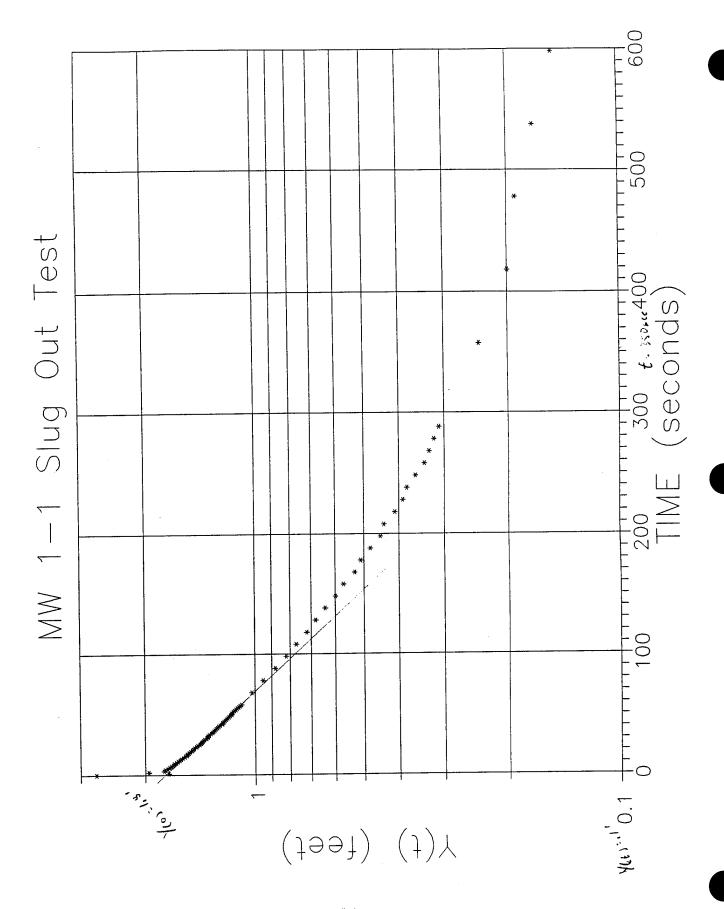
TIME	TRANSDUCER READING (FEET)		ATER LEVEL Change (Feet)	TIME	TRANSDUCER READING	TIME	CHANGE
1105	(FEE1)	(357)	(FEE!)	1110	(FEET)	(SEC)	(FEET)
1:15:00 PM				01:22:00	PM 12.87		
1:16:00 PM				01:23:00			
1:17:00 PM				01:23:00			
1:18:00 PM				01:25:00			
1:19:00 PM				01:25:01			
1:20:00 PM				01:25:02			
1:21:00 PM	12.88			01:25:03		0	
				01:25:04		1	
	in test not per			01:25:05		2	
	el was too close			01:25:06		3	
	water overtopped		he	01:25:07		4	1.8
inse	ertion of the slu	g into the well.		01:25:08		5	
				01:25:09		6	1.7
				01:25:10		7	
				01:25:11		8	1.6
				01:25:12		9	•
				01:25:13		10	
				01:25:14		11	
				01:25:15		12	
				01:25:16 01:25:17		13	
				01:25:17		14	
				01:25:18		15	
				01:25:17		16	1.3
				01:25:20		17 18	
				01:25:22		19	
				01:25:23		20	
				01:25:24		21	
				01:25:25		22	
	•			01:25:26		23	
				01:25:27		24	
				01:25:28		25	
				01:25:29		26	
				01:25:30		27	
				01:25:31		28	
*				01:25:32	PM 11.9	29	
				01:25:33	PM 11.93	30	0.9
				01:25:34	PM 11.95	31	0.9
				01:25:35		32	
				01:25:36		33	
				01:25:37		34	
				01:25:38		35	
				01:25:39		36	
				01:25:40		37	
				01:25:41		38	
				01:25:42		39	
				01:25:43		40	
				01:25:44		41	
				01:25:45 01:25:46		42	
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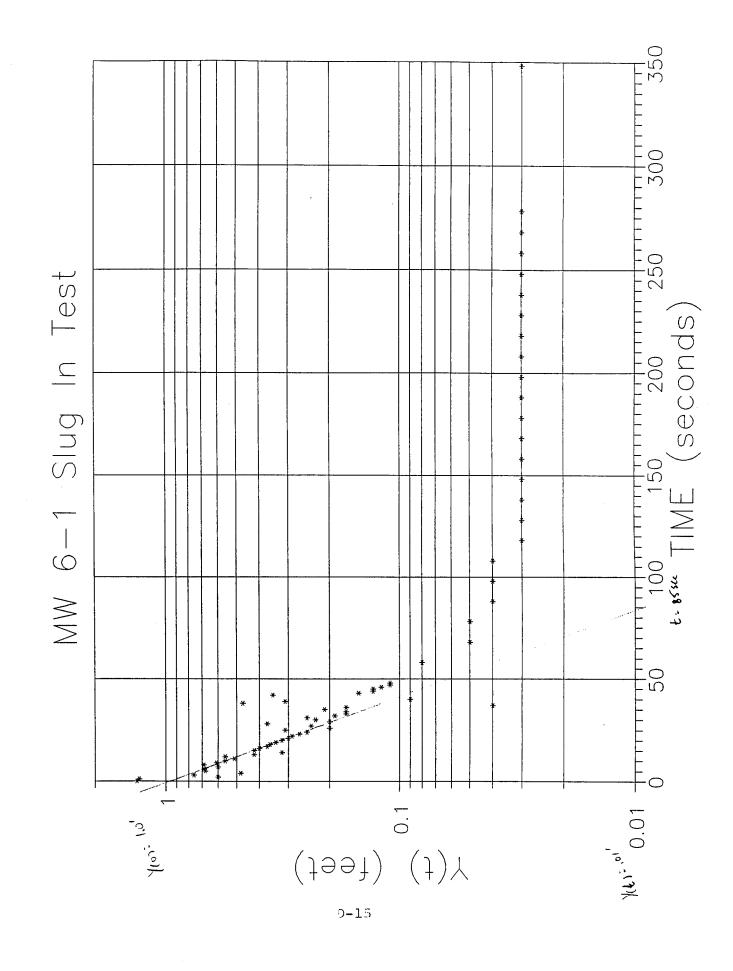
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01:25:51	PM	12.24	48	0.63
01:25:52	PM	12.25	49	0.62
01:25:53	PH	12.27	50	0.6
01:25:54	PM	12.27	51	0.6
01:25:55	PM	12.29	52	0.58
01:25:56	PM	12.3	53	0.57
01:25:57	PĦ	12.31	54	0.56
01:25:58	PM	12.33	55	0.54
01:25:59	PM	12.34	56	0.53
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01:26:10	PM	12.44	67	0.43
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01:26:30	PM	12.58	87	0.29
01:26:40	PM	12.62	97	0.25
01:26:50	PM	12.66	107	0.21
01:27:00	PM	12.7	117	0.17
01:27:10	PĦ	12.72	127	0.15
01:27:20	PM	12.74	137	0.13
01:27:30	PĦ	12.76	147	0.11
01:27:40	PM	12.77	157	0.1
01:27:50	PM	12.78	167	0.09
01:28:00	PM	12.79	177	0.08
01:28:10	PĦ	12.8	187	0.07
01:28:20	PH	12.8	197	0.07
01:28:30	PM	12.81	207	0.06
01:28:40	PĦ	12.82	217	0.05
01:28:50	PM	12.82	227	0.05
01:29:00	PH	12.82	237	0.05
01:29:10	PM	12.83	247	0.04
01:29:20		12.84	257	0.03
01:29:30	PĦ	12.83	267	0.04
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01:29:50		12.84	287	0.03
01:30:00	PM	12.85	297	0.02

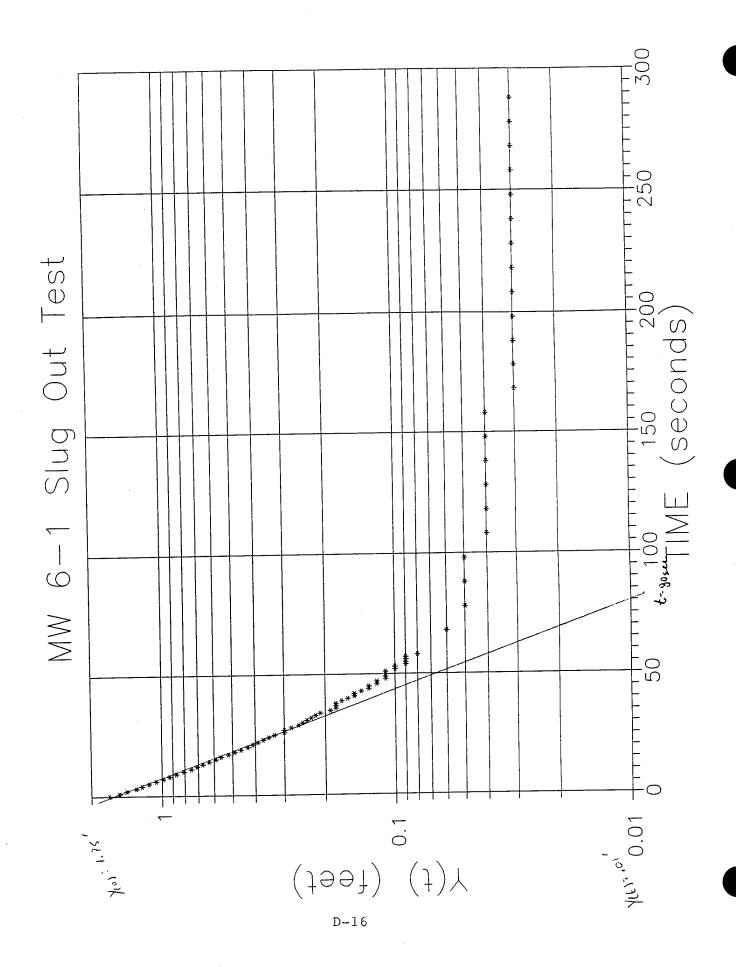


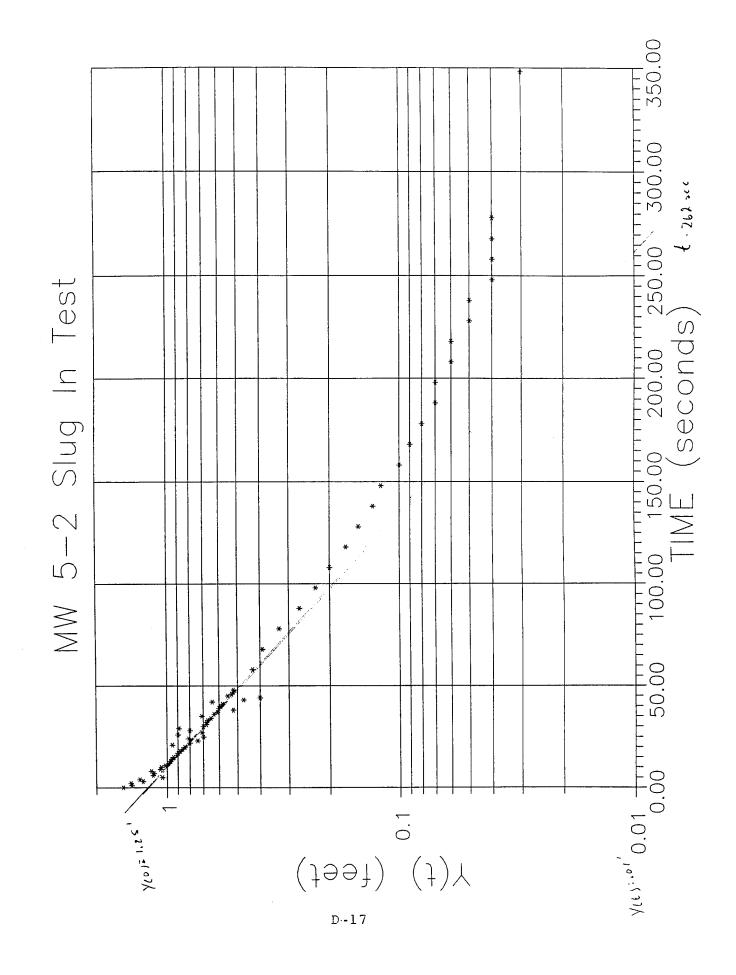


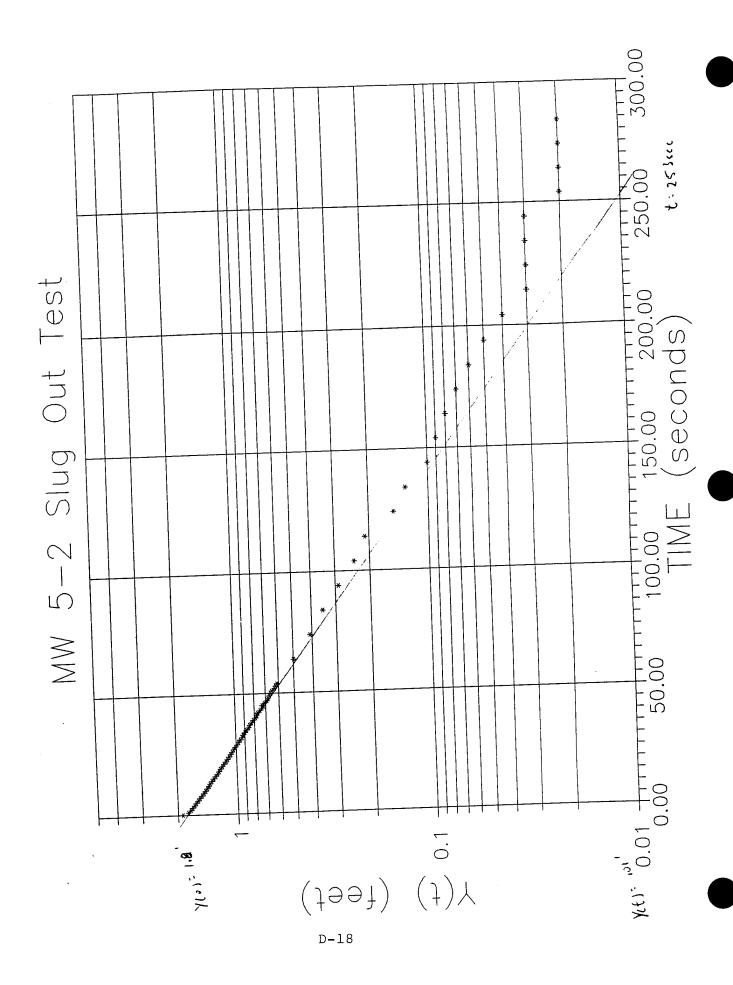


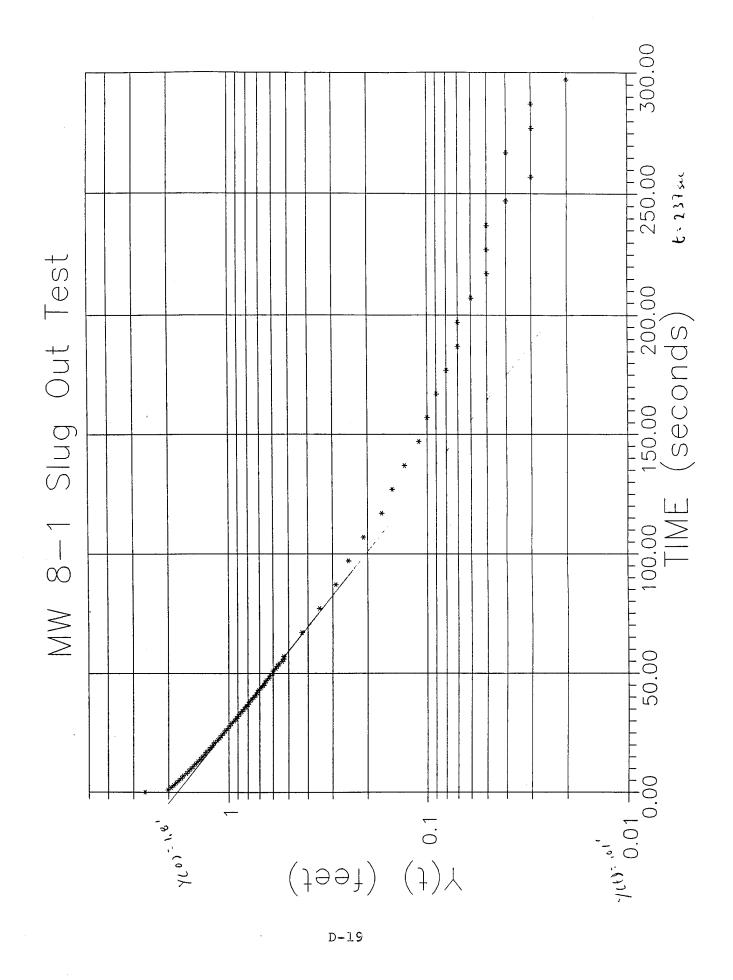












FANG SLUG TEST ANALYSES FULL PENETRATION ASSUMED

GNV27267.JX.RI

CM		

-	WELL #	WELL RADIUS Rc,(FT)	WELL DEPTH BLS (FT)	DTW FROM SURFACE (FT)	WELL DEPTH BELOW WATER LW, (FT)	SCREEN LENGTH Le,(FT)	BORHOLE RADIUS Rw,(FT)	\$APPROX. SAT. THICK. H,(FT)	COMPUTED Ln Lw/Rw	Le/Rw		COMPUTED _N(Re/Rw)
_	3E-2	0.0833	15	3.77	11.23	10	0.167	11.23	4.21	60.00	3	3.213
	1-1	0.0833	15	2.07	12.93	10	0.167	12.93	4.35	60.00	3	3.303
	6-1	0.0833	15	3.57	11.43	10	0.167	11.43	4.23	60.00	3	3.224
	5-2	0.0833	15	2.95	12.05	10	0.167	12.05	4.28	60.00	3	3.258
	8-1	0.0833	15	0.34	14.66	10	0.167	14.66	4.48	60.00	3	3.382

	WELL #		OUT	TIME T (SEC)	TIME T (FT)	Y(0) (FT)	(FT/SEC)	COND., K (FT/DAY)
=				235				1.04
								1.45
_		X					9.91E-06	0.86
	1-1						9.47E-06	
-	6-1	χ					6.06E-05	
_	6-1		X	80	0.01	1.75	7.23E-05	6.24
-	5-2	χ		262	0.01	1.25	2.08E-05	1.80
	5-2		X	253	0.01	1.8	2.32E-05	2.01
-	8-1	X						
=	8-1 =====							2.22

FANG SLUG TEST ANALYSES PARTIAL PENETRATION ASSUMED

GNV27267.JX.RI

COMPUTED	1
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WELL #	WELL RADIUS Rc,(FT)	WELL DEPTH BLS (FT)	DTW FROM SURFACE (FT)	WELL DEPTH BELOW WATER Lw,(FT)	SCREEN LENGTH Le,(FT)	BORHOLE RADIUS Rw,(FT)	‡APPROX. SAT. THICK. H,(FT)	COMPUTED Ln Lw/Rw	Le/Rw	COEF.	COEF.	COMPUTED LN(Re/Rw)
3E-2	0.0833	15	3.77	11.23	10	0.167	INFINITE	4.21	60.00	3.25	0.55	2.700
1-1	0.0833	15	2.07	12.93	10	0.167	INFINITE	4.35	60.00	3.25	0.55	2.763
6-1	0.0833	15	3.57	11.43	10	0.167	INFINITE	4.23	60.00	3.25	0.55	2.708
5-2	0.0833	15	2.95	12.05	10	0.167	INFINITE	4.28	60.00	3.25	0.55	2.731
8-1	0.0833	15	0.34	14.66	10	0.167	INFINITE	4.48	60.00	3.25	0.55	2.818

SELECTED Y(T) & HYD. HYD. WELL SLUG SLUG TIME T TIME T Y(0) COND., K
IN OUT (SEC) (FT) (FT) (FT/SEC) COND., K (FT/DAY) 3E-2 X 235 0.10 1.25 1.01E-05 0.87 3E-2 X 180 0.10 1.5 1.41E-05 1.22 1-1 X 580 0.01 1.5 8.29E-06 0.72 1-1 X 350 0.10 1.8 7.92E-06 0.68 85 0.01 1 5.09E-05 4.40 6-1 X 80 0.01 1.75 6.07E-05 5.24 5-2 X 262 0.01 1.25 1.75E-05 1.51 5-2 X 253 0.01 1.8 1.95E-05 1.68 8-1 X 8-1 X 237 0.01 1.8 2.14E-05 1.85

APPENDIX E

Data Validation Technical Memorandum for the First Step of the Site Investigation

FOREWORD

Data for the first step of the site investigation were validated by CH2M HILL personnel (Chris Ohland and Ann Castleberry) who are not employed by CH2M HILL Environmental Laboratories, Inc. The following technical memorandum describes site investigation data, its quality, and its usability.

MEMORANDUM

TO:

Becky Svatos/GNV

FROM:

DATE:

Chris Ohland/GLO Ann Castleberry/MGM

August 21, 1989

SUBJECT:

Data Validation for Jacksonville ANG

PROJECT:

GNV27267.JX.SI

1.0 INTRODUCTION

This Technical Memorandum presents the data validation discussion and summary tables for the first step of the Jacksonville Air National Guard (ANG) Site Investigation (SI) laboratory data. Data validation is the technical review of a data package using criteria established in the Data Quality Objectives.

The samples from the first step of the SI were analyzed for semivolatiles by gas chromotography/ mass spectrophotometer (GC/MS), volatiles by GC/MS, volatile halocarbons by gas chromotography (GC), volatile aromatics by GC, polychlorinated biphenyls (PCB) by GC/MS, ethylene dibromide (EDB) by GC and GC/MS, polynuclear aromatic hydrocarbons (PAH) by GC/MS, total organic carbon (TOC), total suspended solids (TSS), and metals. Participating laboratories were required to submit the Hazardous Waste Remedial Action Program (HAZWRAP) Level C quality control (QC) data packages for data generated for the SI. Level C QC has established data set deliverables analogous to the Contract Laboratory Program (CLP) deliverables. CLP was developed to standardize the laboratory methods and data package deliverables used for remedial investigations, Superfund work, etc.

Data were reviewed and validated using HAZWRAP Level C Data Validation Guidelines. For methods not listed in HAZWRAP, a similar procedure, which outlines samples holding times, initial calibration, continuing calibration, matrix spike, blank spike, and blank versus sample results was reviewed. In addition, the EPA Laboratory Data Validation Functional Guidelines (4, 5) were used to supplement HAZWRAP guidelines when no acceptance ranges or control limits were established.

When samples were received by the laboratory, they were assigned unique laboratory numerical identifiers. The first five digits of the laboratory sample number indicates the sample batch or sample delivery group, while the last three digits identify each unique sample. This sample numbering system ensures that the sample identity is unknown to the analyst. Table 1.1 correlates field sample point to laboratory number for ease in locating specific field sites. Samples were analyzed in the CH2M Hill Laboratories located in Montgomery, Alabama; Gainesville, Florida; and Redding, California.

For ease of discussion, the results of the validation process will be discussed in the following order: organic analyses, inorganic analyses, wet laboratory analysis.

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2.0 ORGANIC ANALYSES

2.1 INTRODUCTION

The organic analyses data generated were reviewed and validated using HAZWRAP Level C Data Validation Guidelines and supplemented using the guidance document Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (1). The required Level C data deliverables are laboratory control charts and forms analogous to those required in the CLP Statement of Work (SOW) (4). The validation guideline documents list criteria for evaluating the complete data package form by form. A quick review of the forms is useful for understanding the validation process. The forms summarize and present the raw, experimental data. The raw data are included in the data package as supporting documentation.

Form I--Data Sheet. This form presents the sample results and the information necessary for calculating holding times and is reviewed for completeness. Holding time is defined as the number of days from the collection of the sample to the extraction and/or analysis. It is important to note that the holding time for extraction is often different for water and soils for the same analytical method. Table 2.1 presents the EPA's recommended holding times.

Form II--Surrogate Recovery. This form summarizes the surrogate spike recovery data. Surrogate compounds are the structural homologs of target list compounds, often with deuterium substituted for hydrogen, and are therefore expected to behave similarly during the analysis. Spike recoveries demonstrate laboratory performance and are evaluated using acceptance ranges delineated in the CLP SOW. Spike recoveries can also be used to estimate accuracy, which is a measure of the agreement between an experimental determination and the true value of the parameter being measured.

Form III--Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recovery. This form presents the recoveries of the MS/MSD compounds. Matrix spike compounds are found on the method target compound list (TCL). The field sample is split and a portion is spiked with known quantities of TCL compounds to ascertain the effects of the specific sample matrix on the recovery of analytes. Acceptance ranges are delineated in the CLP SOW. MS/MSD spike recoveries can also be used to estimate accuracy and precision. Precision is a measure of the agreement or repeatability of a set of replicate results obtained from duplicate analyses made under the same conditions.

Form IV--Method Blank Summary. The method blank summary sheets correlate method blanks to samples. Method blanks are ASTM Type III (distilled, deionized) water that are treated as a sample in the laboratory--in other words, they undergo the same analytical process as the corresponding samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. The usual frequency is 1 in 10 or 20 (depending on the analytical method) or one per batch, whichever is more frequent.

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Form V--GC/MS Tuning and Mass Calibration. This form presents the tuning and mass calibration information for each GC/MS instrument used to produce data in the data package. The CLP SOW establishes tuning and performance criteria to ensure mass resolution, identification, and, to some degree, sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances. For volatiles analyses, Bromofluorobenzene (BFB) is used; and for semivolatiles, Decafluorotriphenylphosphine (DFTPP) is employed. Tuning compounds for PCB, EDB, and PAH using GC/MS are not reported. Analysis for PCB, EDB, and PAH using a gas chromatograph require no tuning process.

Form VI and VII--Initial and Continuing Calibration. This form is used to report compound recoveries from calibration solutions. Initial calibration data demonstrate that the analytical instrument is performing satisfactorily and is capable of producing acceptable quantitative data at the beginning of the analytical period. Continuing calibration checks document that the instrument continues to produce acceptable data. Calibration spike recoveries must fall within a tight acceptance window in order for analysis to begin or continue.

Form VIII--Internal Standards. This form presents the internal standards peak area information. Internal standard compounds are used to ensure that analytical instrument sensitivity and response is stable during every run. Acceptance criteria are established in the Functional Guidelines.

Form VIIIB--Pesticide Evaluation Standards Summary. This form is used to report the 72-hour analytical sequence for pesticide analysis. The instrument is calibrated at the beginning of the 72-hour analytical sequence and then the calibration is checked every five samples. Note that a pesticide/PCB analysis was not performed in this work plan.

Form IX--Pesticide/PCB Standards Summary. This form is only included for pesticide/PCB analyses and is used to monitor variations in the calibration factor and retention time for each pesticide/PCB standard during each 72-hour period. The calibration factor is the ratio of the total chromatographic peak area of a standard to the concentration of the standard in the sample; it should remain constant over time. This factor demonstrates that the chromatographic system is operating consistently over time. Retention time is the residence time of an analyte on the chromatographic column and also should remain constant over time. Acceptance ranges for both calibration factor and retention time are delineated in the CLP SOW. Note that a pesticide/PCB analysis was not performed in this work plan.

Form X--Pesticide/PCB Identification. This form is only included in the Pesticide/PCB data package and it summarizes the tentative and confirmed identity of all TCL pesticides and PCBs detected in a given sample. If any pesticide or PCBs are detected above the detection limit on the first column, then a second, different

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chromatographic column is used to confirm both the identity and quantification of the pesticide or PCB. Note that a pesticide/PCB analysis was not performed in this work plan.

Supporting documentation is also thoroughly reviewed. Areas for review include TCL compound identification, compound quantification and reported detection limits, and tentatively identified compounds.

Included with the field samples were trip blanks. This blank consists of ASTM Type III water that is prepared in the laboratory before sampling. The water is stored in volatile organic analysis (VOA) bottles, not opened in the field, and travels back to the laboratory with the other VOA GC and GC/MS samples. This blank monitors possible contamination introduced during the sample bottle trip; the usual frequency is one trip blank per shipping container.

2.2 ORGANIC DATA VALIDATION SUMMARY TABLES

Before the analytical results are released from the laboratory, careful review of both the sample and the quality control data is required. Laboratory personnel review the raw data to verify sample identity, instrument calibration, detection limits, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the quality control samples are processed to demonstrate that the analytical results are within laboratory-prescribed criteria for accuracy and precision. This technical memorandum includes only summary tables for the data validation process; the original data sheets and data summary tables appear in other sections of the report.

Data validation summary tables presented in this section are a summary of the Quality Assurance/Quality Control (QA/QC) information for each laboratory sample batch by analyses. The tables are arranged by analyses and separated by sample delivery group (the first five digits of laboratory sample number).

Sample QA/QC information presented in the summary tables includes MS/MSD percent recovery and precision, surrogate spike recovery, holding time, and laboratory method blank analyses. Data validation summary tables organize samples by the corresponding MS/MSD samples. Data that do not strictly meet the criteria are qualified with flags, single letter abbreviations that indicate a problem with the data. Although the flags originate in the data validation section, they are included in the data summary tables (in the main body of the text) so that data will not be used indiscriminately. Acceptable matrix spike recovery ranges are defined in the appropriate SW 846 method (3). No surrogate recovery control limits are established in the SW 846 methods. Acceptable ranges for surrogate recoveries from the CLP SOW (4) were applied to semivolatiles and VOA GC/MS because the CLP methods are analogous. For the PAH GC/MS analysis, acceptable ranges for the terphenyl surrogate are taken from SW 846 methodology. Tables 2.2 and 2.3 summarize the acceptable limits for each analysis and a source reference. Flags used in the text include:

- U Undetected. Analyte was analyzed for but not detected above the method detection limit.
- B Analyte was not detected above 5 times (10 times for common laboratory solvents) the concentration reported in the laboratory blank.

- J Estimated. Analyte was present but the reported value may not be accurate or precise. For example, the MS/MSD precision is outside the acceptable range and the data may be biased high or low.
- K Analyte was present but the reported value may be biased high; the actual value is expected to be lower. For example, the surrogate spike recovery was above the acceptable limits.
- Analyte was present but the reported value may be biased low; the actual value is expected to be higher. For example, the holding time was exceeded or the surrogate spike recovery was below the acceptable limits.
- M Duplicate precision was not met. It is not possible to determine whether the resulting bias is high or low.

It is important to note that the Data Summary Sheets, Form I, also have flags on them and the usage is the same as listed above. Additionally, under the current CLP SOW, the laboratory is required to report any analyte concentration that is above the instrument detection limit but below the Contract Required Quantification Limit (CRQL). These analyte concentrations are flagged "J" for data estimated.

The summary tables for a given analytical method are presented by laboratory number (in ascending sequential order). The data validation summary tables are discussed below by category in the same order that they appear. The order for the data validation summary tables is listed below.

Analysis	<u>Table Numbers</u>
Semivolatiles	2.4-2.7
Volatiles GC/MS	2.8
Volatile Halocarbons	2.9-2.13
Volatiles Aromatics	2.14-2.18
PAH GC/MS	2.19-2.21
EDB GC and GC/MS	2.22-2.26
PCB GC/MS	2.27-2.28
TOC	3.1-3.3
TSS	3.4-3.5
Metals	4.1-4.5

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2.2.1 Semivolatiles

In some soil samples only base/neutral reporting was requested (for PAH content); however, the analysis was performed as if a full target compounds list was required. For semivolatile analysis, one surrogate per fraction (acid or base/neutral) can be outside the acceptance range without the data being flagged as long as the recovery is equal or greater than 10 percent.

In Table 2.4 the MS recovery for 2-chlorophenol is below the acceptance range and flagged "L", estimated low. Recovery from the MSD was above acceptance range for 4-nitrophenol and flagged "K", estimated high. All acid fraction recoveries from the MS are significantly lower than the MSD recoveries. The low recoveries are consistent with the low surrogate values also reported. The case narrative suggests the sample pH was improperly adjusted before extraction of the acid fraction. No qualifying of the data set is supported because of the low recovery.

Drainageway water sample 4 OWS had two surrogate values below acceptable range. Sample reanalysis provided acceptable surrogate recoveries. Drainageway water sample R5C was reanalyzed at a high dilution because of the presence of high concentration, non target compounds and viscosity of the extract. The surrogates were diluted below the level of detection and could not be evaluated.

The common contaminant bis(2-ethly-hexyl)phthalate was present in the trip, field, and laboratory blanks. All samples containing this contaminant at concentrations below 10 times the blank level are flagged "B", blank contamination.

In Table 2.5 the spike recoveries for phenol are above the acceptable range, and flagged "K", estimated high. No qualifing of the data set is supported because of the low recovery.

The common contaminant bis(2-ethyl-hexyl)phthalate was detected in the rinse and field blank. The blank samples are water matrixes and direct comparison of concentration values to soil matrixes is inappropriate. Because the phthalate was reported in the blanks and some soil samples, the data user should suspect that low concentration contamination occurred. No blank contamination flags were added to the data.

In Table 2.6 the initial calibration and continuing calibration each have one outlier. The calibration compound outliers are not reported in any of the samples; therefore, no action is required.

The method blank for the sample batch contained the common contaminant bis(2-ethyl-hexyl)phthalate. All samples containing this contaminant at concentrations below 10 times the blank level are flagged "B", blank contamination.

In Table 2.7 the matrix spike recovery for 4-nitrophenol is above acceptable range and flagged "K", estimated high. Matrix spike recovery for phenol was below acceptable range and flagged "L", estimated low. No qualification of the data set is made on the basis of spike recovery.

Surrogate recoveries for groundwater sample 3E-6, MS, and MSD (the MS/MSD were spiked in sample 3E-6) were below the acceptable range for phenanthrene-d10. No

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reanalysis was required because the MS/MSD analyses substantiate the low recovery in the sample.

The laboratory, field, rinse, and trip blank were contaminated with bis(2-ethyl-hexyl)phthalate. All samples containing this contaminant at concentrations below 10 times the laboratory blank level are flagged "B", blank contamination.

Because of a calibration outlier, the reported concentration of benzoic acid in groundwater sample WP4-1 is flagged "J", estimated.

2.2.2 Volatiles GC/MS

In Table 2.8, groundwater sample 3E-6 contains a high concentration of acetone and the laboratory blank is contaminant free. Reanalysis of the sample at a 1:100 dilution brought acetone into calibration range of the instrument but the laboratory blank also contained acetone as a contaminant. Acetone is present in the sample as demonstrated by the first analysis; however, the concentration is not quantified accurately and so is flagged "J", estimated with unknown bias. All other QA/QC measures are within acceptable range and no further qualification is required.

2.2.3 Volatile Halocarbons

Tables 2.9 through 2.13 summarize the QA/QC data for the purgeable halocarbons analysis. No surrogate recovery control limits are established for this method; instead, the performing laboratory established its own monitoring program. Blank spike control charts provided by the laboratory are used to evaluate surrogate recovery performance. Analytical difficulties encountered by the laboratory in performing this method were cause to qualify all reported data. Discussion of the problems that affect all samples are presented.

The method requires that calibration standards at a minimum of three concentration levels for each parameter be used to calibrate the GC system. One of the external standards used in calibrating the instrument should be at a concentration near but above the method detection limit; the other concentrations should correspond to the expected range of concentrations in real samples. The results can be used to prepare a calibration curve for each analyte. Alternatively, if the ratio of response to concentration (calibration factor) is constant over the working range (i.e., less than 10 percent relative standard deviation (RSD)), linearity through the origin can be assumed and the average calibration factor used in place of a calibration curve. Additionally, a continuing calibration check standard should be analyzed routinely to verify the performance of the GC. In all five sample batches the 10 percent RSD criteria for initial calibration linearity and the 15 percent D criteria for continuing calibration check difference were routinely missed; therefore, performance of the chromatographic system is in doubt and all reported analyte concentrations are flagged "J", estimated with unknown bias.

There are three significant points that support the reliability of the data. First, matrix spike samples (spiked at 20 $\mu g/l$, water; 2 mg/kg, soil) are reasonably recovered, which indicates good system performance in the concentration region of 20 $\mu g/l$ in water and 2 mg/kg in soil. Secondly, calibration performance does not affect qualitative assessment (assignment of peak identity) of the compounds (this has some restrictions which will be discussed below). Third, one initial calibration standard containing component concentration at

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the method detection limit was analyzed. This is important in that the laboratory has demonstrated the ability to detect concentrations at 1 $\mu g/l$ in water and 0.1 mg/kg in soil.

One basis for reporting a positive result is whether the analyte response is equal to or greater than 1 $\mu g/l$ in water or 0.1 mg/kg in soil. The accuracy of the mean relative response factor, which is used to calculate concentration, is uncertain. Because of the inaccurate response factor some analyte responses may be calculated below the reporting criteria and reported as nondetects even though concentrations of purgeable halocarbons may actually be present at levels approximately the reported detection limit.

The concentration ranges that are most affected by the calibration error are those at or near the method detection limit. This is demonstrated by reviewing the initial calibration response factor variability. Components in the low concentration calibration standard are the furthest from the mean relative response factor.

All samples with reported sample concentrations are flagged "J", estimated with unknown bias. The data user should recognize that samples that report analytes "less than" may contain analytes in lower concentrations.

2.2.4 Volatile Aromatics

Tables 2.14 through 2.18 summarize the QA/QC data for the purgeable aromatic analysis. No surrogate recovery control limits are established for this method; instead, the performing laboratory established its own monitoring program. Blank spike control charts provided by the laboratory are used to evaluate surrogate recovery performance.

In Table 2.14 matrix spike recovery for 1,4-dichlorobenzene is below the acceptable range and flagged "L", estimated low. No additional action is taken because samples did not contain this compound. The laboratory blank contained toluene at 1 μ g/1. All samples containing the common contaminant toluene at less than 10 times the reported blank concentration were flagged "B", blank contamination.

In Table 2.15, the surrogate recovery for drainageway sediment sample R4C is above acceptable range and flagged "K", estimated high. All other QA/QC measures were within acceptance range and additional qualification is not required.

In Table 2.16 the matrix spike recoveries were both above and below acceptable range and flagged "J", estimated, for tert butyl methyl ether. Precision is also unacceptable. Precision criteria were above the acceptable range for ethyl benzene and o-xylene and flagged "J", estimated. The imprecision may be related to purging efficiencies of the MS and MSD, but this data could not be evaluated because the surrogate recoveries were not reported. All samples with reported concentrations of these compounds are flagged "J", estimated.

In Table 2.17 all the QA/QC measures for purgeable aromatic analysis of soil are within acceptable ranges. The data are acceptable and can be used without qualification.

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In Table 2.18 matrix spike recoveries for tert butyl methyl ether are both above and below acceptable ranges and flagged "J", estimated. All samples with reported concentrations of this compound are flagged "J", estimated.

Holding time was exceeded for groundwater samples 3E-GW-WP8 and 1-GW-WP4. These samples did not contain any reportable concentrations of analytes and no action was taken. The data user should be aware that samples analyzed outside of holding time may have lost volatile components because of diffusion through the sample container.

Because of a continuing calibration outlier for ethyl benzene, all samples containing this component are flagged "J", estimated.

2.2.5 Polynuclear Aromatic Hydrocarbons

No specific surrogate or matrix spike compounds are required in the method. The compounds reported are representative of the PAH group of compounds, and therefore are appropriate. Acceptance ranges for matrix spike and surrogate recoveries are selected from EPA Method 8270. No acceptance ranges for MS/MSD precision are established. The reviewer used professional judgement to evaluate the precision.

Control charts of blank spike data were evaluated using EPA recommended ranges because the laboratory did not have 20 data evaluation points. All blank spikes were within acceptable ranges.

In Table 2.19 all the QA/QC measures for PAH analysis of soils are within acceptable ranges. The data are acceptable as is and can be used without qualification.

In Table 2.20 all the QA/QC measures for PAH analysis of groundwater are within acceptable ranges. The data are acceptable as is and can be used without qualification.

In Table 2.21 the surrogate recovery for groundwater sample 1-GW-WP5 is below the acceptable range and flagged "L", estimated low. No analytes were detected in the sample and the method detection limits may be elevated.

2.2.6 Ethylene Dibromide

Soil samples are analyzed by a laboratory modified method where mass spectro-photometer detection is substituted for electron capture (EC) detection. The method for soil analysis is acceptable.

No specific surrogate or matrix spike compounds are required in the method. The compounds reported were EDB or representative of EDB and therefore are appropriate. No acceptance ranges for matrix spike recoveries, surrogate recoveries, and MS/MSD precision are established. The reviewer used professional judgement to evaluate these quantitative parameters.

Because EPA acceptable ranges for 20 data evaluation points were not available to evaluate blank spike control charts, the reviewer used professional judgement. All blank spikes are acceptable.

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Tables 2.22 through 2.26 summarize the QA/QC data for the EDB analysis. All QA/QC measures are within acceptance limits. The data are acceptable as is and can be used without qualification.

2.2.7 Polychlorinated Biphenyls

The laboratory substituted mass spectrophotometer detection for EC detection and used the surrogate 4-bromobiphenyl. The method substitutions for soil analysis are acceptable.

No specific surrogate or matrix spike compounds are required in the method. The compounds reported were PCB or representative of PCB and therefore are appropriate. No acceptance ranges for matrix spike recoveries, surrogate recoveries, and MS/MSD precision are established. The reviewer used professional judgement to evaluate these quantitative parameters.

Because EPA acceptable ranges for 20 data evaluation points were not available to evaluate blank spike control charts the reviewer used professional judgement. All blank spikes are acceptable.

Tables 2.27 and 2.28 summarize the QA/QC data for the PCB analysis. All QA/QC measures are within acceptance limits. The data are acceptable as is and can be used without qualification.

3.0 WET CHEMISTRY

Samples analyzed by wet chemistry methods do not have format-specific deliverables. The review of this data consists of checking that the following QA/QC was performed and acceptable: initial calibration or calibration verification, MS/MSD, laboratory blank, blank spike, and control charts.

3.1 TOTAL ORGANIC CARBON

In Tables 3.1 through 3.3 all QA/QC measures are within acceptable ranges and the supporting documentation is present. The data are acceptable and can be used without qualification.

3.2 TOTAL SUSPENDED SOLIDS

In Tables 3.4 and 3.5 no matrix spike was performed on site-specific samples. Qualification is unnecessary based on the deficiency because a control blank spike was performed. All other QA/QC measures are within acceptable ranges and the supporting documentation is present. The data are acceptable and can be used without qualification.

4.0 METALS ANALYSES

4.1 INTRODUCTION

Metal analyses data are reviewed and validated using HAZWRAP Level C Data Validation Guidelines and supplemented using the guidance document "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" (5).

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The required Level C data deliverables are laboratory control charts and the forms used in the CLP Statement of Work (SOW). A quick review of the forms is useful for understanding the validation process. The forms summarize the raw, experimental data.

Form I--Data Sheet. This form presents the sample results and is reviewed for completeness.

Form IIA--Initial and Continuing Calibration Verification. This form is used to report analyte recoveries from calibration solutions. Initial calibration data demonstrate that the analytical instrument is performing satisfactorily and is capable of producing acceptable quantitative data at the beginning of the analytical period. Continuing calibration checks document that the instrument continues to produce acceptable data. Calibration spike recoveries must fall within a tight acceptance window in order for analysis to begin or continue.

Form IIB--CRDL Standard for AA and ICP. This form is used to report analyte recoveries from analyses of the Contract Required Detection Limits (CRDL) standards for AA and ICP. The laboratory analyzes a standard solution that is twice the Instrument Detection Limit (IDL) to verify the linearity of the instrument at low detection limits.

Form III--Blanks. This form is used to report analyte concentrations detected in the Initial Calibration Blank (ICB), Continuing Calibration Blanks (CCB), and the Preparation Blank (PB). Method blanks are used to determine the existence and magnitude of contamination problems. If problems with any blank exist, all data associated with that sample delivery group must be carefully evaluated to determine if there is a problem with the entire analytical group or it is an isolated incident.

Form IV--ICP Interference Check Sample (ICS). This form is used to report ICS results for each ICP instrument used. The ICS is a mixture of analytes that have a potential for interference; it is performed to verify the laboratory's interelement and background correction factors.

Form VA--Spike Sample Recovery. This form is used to report results for the predigestion spike recovery. This spike recovery measurement is analogous to the MS/MSD spike recovery for organic analyses in that it measures the effects of the sample matrix on the recovery of a known quantity of analyte. Additionally, it also measures the efficiency of the digestion process. If the predigestion spike recovery does not fall within preset limits (usually 75 to 125 %), then a postdigestion spike is added and the sample reanalyzed.

Form VB--Postdigestion Spike Sample Recovery. This form is used to report recovery results for the above mentioned postdigestion spike. Again the preestablished acceptance limit for recovery is 75 to 125%. If both the pre and postdigestion spike recovery is outside the acceptance limits, this is considered positive evidence of matrix interferences, and the data is flagged "J", estimated.

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Form VI--Duplicates. This form is used to report the results of duplicate laboratory analysis rather than a field duplicate. This duplicate differs from the MSD used in organic analyses in that the analyte concentration measured is native to the sample rather than that which has been added (spiked). Duplicate analyses are required for calculating percent solids (for soil samples) and all analyte results. Duplicate data are used to calculate precision for all analyte concentrations greater than 5 times the CRDL. Acceptance limits are set at 0 to 20%.

Form VII--Laboratory Control Sample. This form is used to report the recovery results for the standard Laboratory Control Sample (LCS). The LCS analysis is designed to serve as a monitor of the efficiency of the digestion procedure and analyte recoveries must fall within acceptance limits (usually 90 to 110 %).

Form VIII--Standard Addition Results. This form is used to report the results of samples analyzed using the Method of Standard Additions and is only used for Graphite Furnace Atomic Absorption analysis. Duplicate injections and furnace postdigestion spike recoveries are used to establish the precision and accuracy of the individual analytical determinations. For all analyte concentrations greater than 5 times the CRDL, acceptance limits of 0 to 20% relative standard difference have been established in the CLP SOW.

Form IX--Inductively Coupled Plasma Serial Dilution. This form is used to report results for Inductively Coupled Plasma (ICP) serial dilution, which determines whether significant physical or chemical interferences exist due to sample matrix effects. For any analyte whose concentration is 50 times greater than the IDL, the sample is diluted and the results compared (diluted versus undiluted) for agreement (precision).

Form X--Holding Times. This form is used to report holding times for mercury (28 days) and cyanide (14 days). Samples that are not analyzed within the holding times are flagged "L" for biased low.

Form XI--Instrument Detection Limits (Quarterly). This form documents the quarterly IDL study conducted by the laboratory for each instrument used to produce the data package. Additionally, the raw experimental and supporting documentation are thoroughly reviewed. Areas for review include: analyte quantification and reported detection limits, strip chart recordings, and instrument data system printouts.

4.2 INORGANIC DATA VALIDATION SUMMARY TABLES

Each table presents the validation information for one sample delivery group and sample matrix. Data nonconformances are indicated with flags in the appropriate block and the nonconformance is discussed in the corresponding text section. Although the flags originate in the data validation section, they are included on the data summary tables (in the main body of the text) so that data will not be used indiscriminately. Control limits are delineated in the appropriate method (3) or utilized from the CLP SOW (5) when the method does not have

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established control limits. The acceptable limits for each analysis and a source reference are included in Table 2.3. The text is organized by sample delivery groups.

No calibration data was included in any of the five data packages. A blank and at least one standard must be used to establish the analytical curve for elements analyzed by ICP. A blank and at least three standards, one of which must be at the CRDL, must be used in establishing the analytical curve for elements analyzed by Atomic Absorption (AA). Instead an Initial Calibration Verification standard (ICV) was analyzed at the start of the day's analysis. The ICV standard was within the acceptance limits (90 to 110% Recovery) and the ICP is known to be a stable instrument over time, so no action is taken in regard to the missing calibration.

Holding times were reported for mercury analysis and are acceptable. No holding times were reported for the remaining elements and are assumed to be met because the data reporting date preceded holding time expiration. Analysis dates are also inferred from control chart documentation but inconsistent reporting made this source unreliable.

In Table 4.1 the LCS result is not provided for silver. The spike and duplicate results for silver were acceptable. Because no acceptance ranges are established for silver and other QC criteria are met, qualifications are not imposed.

The trip blank was used for the mercury matrix spike and duplicate. Using this sample does not provide a reliable test for matrix effect; however, no qualification is supported based on this error.

Chromium concentration values less than 5 times the amount present in the preparation blank are flagged "B", blank contamination.

In Table 4.2 the matrix spike for lead is below the acceptance range and flagged "L", estimated low. The native sample concentration was twice the amount of the spike and contributed to the low recovery.

LCS recoveries are below acceptance range for chromium and selenium and are flagged "L", estimated low. All samples with chromium concentrations greater than CRDL are flagged "L." Samples containing selenium are less than CRDL and flags are not needed.

Insufficient raw data are available to apply the aqueous preparation blank contamination to the soil data.

In Table 4.3 barium and lead are reported in the preparation blank and are flagged "B", blank contamination. These elements are also flagged in samples with less than 5 times the reported preparation blank level. All other QA/QC measures are acceptable and no additional action is required.

In Table 4.4 LCS recoveries for arsenic and selenium are below the acceptance range and flagged "L", estimated low. Lead matrix spike recovery is above acceptable range and flagged "K", estimated high. The case narrative states the sample was heterogenous and may have contributed to the recovery difficulty. Samples reporting these elements above CRDL are flagged "L."

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As shown in Table 4.5, a lead predigestion matrix spike was not performed. Although a postdigestion spike was found acceptable, samples containing lead are flagged "J", estimated bias unknown.

Chromium and selenium are flagged "M", duplicate precision not met. Only chromium in groundwater sample WP3E-6 had a concentration greater than CRDL; it is flagged "M."

Matrix spike recovery for mercury is below the acceptance range and flagged "L", estimated low.

5.0 CONCLUSIONS

The Organic data were reviewed and validated using the HAZWRAP Level C Validation Guidelines and supplemented with the EPA Functional Guidelines. The data are acceptable with qualifications as noted in the discussion in Section 2. The wet chemistry data were reviewed and validated using the HAZWRAP Level C Validation Guidelines. The data are acceptable without qualifications. The inorganic data have been reviewed and validated using the HAZWRAP Level C Validation Guidelines and supplemented with the EPA Functional Guidelines. The data are acceptable with qualifications as noted in the discussion in Section 4.

6.0 REFERENCES

- 1. U.S. EPA. Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, 1988 revision.
- 2. U.S. EPA. Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses, 1988 revision.
- 3. U.S. EPA. Test Methods for Evaluating Solid Waste (SW-846), Third edition, September 1986.
- 4. U.S. EPA Contract Laboratory Program Statement of Work for Organic Analyses, 1988 revision.
- 5. U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, 1988 revision.
- 6. U.S. Department of Energy, Hazardous Waste Remedial Actions Program.

 Requirements for Quality Control of Analytical Data. DOE/HWP-65.

 Prepared by Martin Marietta Energy Systems, Inc. August 1988.

Table 1.1
FIELD SAMPLE LIST AND ANALYTICAL METHOD PERFORMED

	Date	Sample	Lab		lytical Method
Field Sample	<u>Sampled</u>	<u>Matrix</u>	Number	<u>a b</u>	<u>c d e f g h i j</u>
R4U	05/26/89	SOIL	13572001	X	X
R4C	05/26/89	SOIL	13572002	X	XXX
R4D	05/26/89	SOIL	13572003	X	X
R4C	05/26/89	WATER	13572004	X	XXXX
R3U	05/26/89	SOIL	13572005	X	X
R3C	05/26/89	SOIL	13572006	X	X X X
R3D	05/26/89	SOIL	13572007	X	X
R3C	05/26/89	WATER	13572008	X	X X X X
SITE 1 CREEK C.P.	05/26/89	SOIL	13572009	X	X
SITE 1 CREEK M.O.	05/26/89	SOIL	13572010	X	X
R2U	05/26/89	SOIL	13572011	X	X
R2C	05/26/89	SOIL	13572012	X	X X X
R2D	05/26/89	SOIL	13572013	X	X
R2C	05/26/89	WATER	13572014	X	X X X X
R1U	05/26/89	SOIL	13572015	X	XX
R1C	05/26/89	SOIL	13572016	X	X X X X
R1D	05/26/89	SOIL	13572017	X	X X
R1C	05/26/89	WATER	13572018	X	X X X X
SITE 4 OWS OUTFALL	05/26/89	SOIL	13572019	X	X
SITE 4 OWS OUTFALL	05/26/89	WATER	13572020	X	X X X X
R5D	05/26/89	SOIL	13572021	X	
R5C	05/26/89	SOIL	13572022	X	X X X
R5C	05/26/89	WATER	13572023	X	X X X X
RINSE WATER BLANK	05/26/89	WATER	13572024	X	X X X X
TRIP BLANK	05/26/89	WATER	13572025	X	X X X X
MATRIX SPIKE	05/26/89	WATER	13572M26	X	X X X
MATRIX SPIKE DUP.	05/26/89	WATER	13572D27	X	X X
DUPLICATE	05/26/89	WATER	13572P28		X
MATRIX SPIKE	05/26/89	SOIL	13572M29	X	X X X X
MATRIX SPIKE DUP.	05/26/89	SOIL	13572D30	X	X X X
DUPLICATE	05/26/89	SOIL	13572P31		X
MATRIX SPIKE	05/26/89	SOIL	13572 M 32		X
DUPLICATE	05/26/89	SOIL	13572 P 33		X
3E-GW-WP1	06/09/89	WATER	13675001		X

a Volatile Halocarbons/Aromatics

b Volatiles (GC/MS)

c Polynuclear Aromatic Hydrocarbons

d PCB

e Semivolatiles

f EDB

g Priority Pollutant Metals

h Lead

i Total Suspended Solids

j Total Organic Carbon

Table 1.1 (Continued)

Field Sample	Date Sampled	Sample <u>Matrix</u>	Lab Number	Analytical Method abcdefghij
3E-GW-WP2	06/09/89	WATER	13675002	X
3E-GW-WP3	06/09/89	WATER	13675003	X
3E-GW-WP4	06/09/89	WATER	13675004	X
3E-GW-WP5	06/09/89	WATER	13675005	X
3E-GW-WP8	06/09/89	WATER	13675006	X
3E-GW-WP9	06/09/89	WATER	13675007	X
3E-GW-WP10	06/09/89	WATER	13675008	X
3W-GW-WP1	06/09/89	WATER	13675009	X
3W-GW-WP2	06/09/89	WATER	13675010	X
3W-GW-WP3	06/09/89	WATER	13675011	хх
3W-GW-WP4	06/09/89	WATER	13675012	X
7-GW-WP1	06/09/89	WATER	13675013	X
7-GW-WP3	06/09/89	WATER	13675014	X
7-GW-WP4	06/09/89	WATER	13675015	X
7-GW-WP6	06/09/89	WATER	13675016	X
7-GW-WP7	06/09/89	WATER	13675017	X
4-GW-WP1	06/09/89	WATER	13675018	хх
4-GW-WP2	06/09/89	WATER	13675019	X
4-GW-WP3	06/09/89	WATER	13675020	X
4-GW-WP10	06/09/89	WATER	13675021	X
1-GW-WP10	06/09/89	WATER	13675022	X
1-GW-WP2	06/09/89	WATER	13675023	X
1-GW-WP3	06/09/89	WATER	13675024	X
1-GW-WP4	06/09/89	WATER	13675025	X
1-GW-WP5	06/09/89	WATER	13675026	X
1-GW-WP6	06/09/89	WATER	13675027	X X
8-GW-WP1	06/09/89	WATER	13675028	X X
8-GW-WP2	06/09/89	WATER	13675029	X
8-GW-WP3	06/09/89	WATER	13675030	X X
8-GW-WP4	06/09/89	WATER	13675031	X
8-GW-WP10	06/09/89	WATER	13675032	X
6-GW-WP1	06/09/89	WATER	13675033	X
6-GW-WP2	06/09/89	WATER	13675034	X
6-GW-WP3	06/09/89	WATER	13675035	X

a Volatile Halocarbons/Aromatics

b Volatiles (GC/MS)

c Polynuclear Aromatic Hydrocarbons

d PCB

e Semivolatiles

f EDB

g Priority Pollutant Metals

h Lead

i Total Suspended Solids

j Total Organic Carbon

Table 1.1 (Continued)

Field Sample	Date Sampled	Sample <u>Matrix</u>	Lab Number		nalyt b <u>c</u> d				
5-GW-WP3	06/09/89	WATER	13675036				X		
TRAVEL BLANK	06/09/89	WATER	13675037				x x		
FIELD BLANK	06/09/89	WATER	13675038				ΧХ		
EQUIPMENT BLANK	06/09/89	WATER	13675039				хх		
MATRIX SPIKE	06/09/89	WATER	13675M43					X	
DUPLICATE	06/09/89	WATER	13675P44					X	
MATRIX SPIKE	06/09/89	WATER	13675M45					X	
DUPLICATE	06/09/89	WATER	13675P46					X	
3E-SL-WP6-1@1.5-2FT	06/07/89	SOIL	13676001	X	ХХ			X	
3E-SL-WP6-2@3.5-4FT	06/07/89	SOIL	13676002	X	хх			X	•
3E-SL-WP7-1@3.5-4FT	06/07/89	SOIL	13676003	X	X			X	
3E-SL-WP1-1@3.5-4FT	06/07/89	SOIL	13676004	X	X			X	
3W-SL-WP1-1@4-4.5FT	06/07/89	SOIL	13676005	X	X			X	
3W-SL-WP5-1@3.5-4FT	06/07/89	SOIL	13676006	X	X			X	
7-SL-WP2-1@3.5-4FT	06/07/89	SOIL	13676007	X	X			X	
7-SL-WP5-1@3.5-4FT	06/07/89	SOIL	13676008	X	X			X	
4-SL-WP1-1@1-1.5FT	06/07/89	SOIL	13676009	X		X	X		X
4-SL-WP10-1@1-1.5FT	06/07/89	SOIL	13676010	X		X	X		X
4-SL-WP1-2@3-3.5FT	06/07/89	SOIL	13676011	X	X			X	
4-SL-WP2-1@2.5-3FT	06/07/89	SOIL	13676012	X	X			X	
4-SL-WP3-1@0.5-1FT	06/07/89	SOIL	13676013	X	X			X	
1-SL-WP1-1@0.5-1FT	06/07/89	SOIL	13676014	X	X			X	
1-SL-WP10-1@0.5-1FT	06/07/89	SOIL	13676015	X	X			X	
1-SL-WP2-1@3.5-4FT	06/07/89	SOIL	13676016	X	X			X	
1-SL-WP3-1@2-2.5FT	06/07/89	SOIL	13676017	X		X	X X		X
1-SL-WP4-1@2.5-3FT	06/07/89	SOIL	13676018	X	X			X	
8-SL-WP1-1@2-2.5FT	06/07/89	SOIL	13676019	X		X	X X		X
8-SL-WP3-1@2.5-3FT	06/07/89	SOIL	13676020	X	X			X	
8-SL-WP4-1@2.5-3FT	06/07/89	SOIL	13676021	X	X			X	
8-SL-WP10-1@2.5-3FT	06/07/89	SOIL	13676022	X	X			X	
5-SL-WP3-1@1-1.5FT	06/07/89	SOIL	13676023	·X	X X		X		
5-SL-WP3-2@4-4.5FT	06/07/89	SOIL	13676024	X	ХХ		X		
5-SL-WP2-1@2-2.5FT	06/07/89	SOIL	13676025	X	X X		X		
6-SL-WP1-1@4.5-5FT	06/07/89	SOIL	13676026	X			X		

a Volatile Halocarbons/Aromatics

b Volatiles (GC/MS)

c Polynuclear Aromatic Hydrocarbons

d PCB

e Semivolatiles

f EDB

g Priority Pollutant Metals

h Lead

i Total Suspended Solids

j Total Organic Carbon

Table 1.1 (Continued)

Field Sample	Date <u>Sampled</u>	Sample <u>Matrix</u>	Lab Number	Analytic a b c d e	al Metho	
6 CI 1700 107 c com	06/07/00		1047400			_
6-SL-WP2-1@4.5-5FT	06/07/89	SOIL	13676027	Х	Х	
MATRIX SPIKE	06/07/89	SOIL	13676M28	X	X	
MATRIX SPIKE DUP.	06/07/89	SOIL	13676D29	X		
DUPLICATE	06/07/89	SOIL	13676P30		X	
3E-GW-WP1	06/13/89	WATER	13701001	X		
3E-GW-WP2	06/13/89	WATER	13701002	X		
3E-GW-WP3	06/13/89	WATER	13701003	X		
3E-GW-WP4	06/13/89	WATER	13701004	X		
3E-GW-WP5	06/13/89	WATER	13701005	X		
3E-GW-WP8	06/13/89	WATER	13701006	X		
3E-GW-WP10	06/13/89	WATER	13701007	X		
3E-GW-WP9	06/13/89	WATER	13701008	X		
3W-GW-WP1	06/13/89	WATER	13701009	X		
3W-GW-WP2	06/13/89	WATER	13701010	X		
3W-GW-WP3	06/13/89	WATER	13701011	X		
3W-GW-WP4	06/13/89	WATER	13701012	X		
7-GW-WP1	06/13/89	WATER	13701013	X		
7-GW-WP3	06/13/89	WATER	13701014	X		
7-GW-WP4	06/13/89	WATER	13701015	X		
7-GW-WP6	06/13/89	WATER	13701016	X		
7-GW-WP7	06/13/89	WATER	13701017	X		
FIELD BLANK	06/13/89	WATER	13701018	X		
EQUIPMENT BLANK	06/13/89	WATER	13701019	X		
2-GW-WP1	06/13/89	WATER		X		
2-GW-WP2	06/13/89	WATER		X		
TRAVEL BLANK	06/13/89	WATER	13701020	X X		
MATRIX SPIKE	06/13/89	WATER	13701M21	X		
MATRIX SPIKE DUP.	06/13/89	WATER	13701D22	X		
3E-GW-WP6	06/15/89	WATER	13726001	X	х х х	X
4-GW-WP2	06/15/89	WATER	13726002	X	A A A	Λ
4-GW-WP3	06/15/89	WATER	13726002	X		
4-GW-WP10	06/15/89	WATER	13726004	X		
1-GW-WP1A	06/15/89	WATER	13726004	X X	X	
1-GW-WP2	06/15/89	WATER	13726005	АА	X	X
- OH HIL	00/13/09	MUITE	13/20000		Λ	Λ

a Volatile Halocarbons/Aromatics b Volatiles (GC/MS)

c Polynuclear Aromatic Hydrocarbons

e Semivolatiles

f EDB

g Priority Pollutant Metals

i Total Suspended Solids

j Total Organic Carbon

Table 1.1 (Continued)

	Date	Sample	Lab	Aı	nalyt	cical l	Method
Field Sample	Sampled_	<u>Matrix</u>	Number	<u>a</u> 1	<u> </u>	i e f	g <u>h</u> i j
1-GW-WP3	06/15/89	WATER	13726007		X		
1-GW-WP4	06/15/89	WATER	13726008		X		
1-GW-WP5	06/15/89	WATER	13726009		X		
1-GW-WP6	06/15/89	WATER	13726010		X		
8-GW-WP2	06/15/89	WATER	13726011		X		
8-GW-WP3	06/15/89	WATER	13726012		X		
8-GW-WP4	06/15/89	WATER	13726013		X		
8-GW-WP10	06/15/89	WATER	13726014		X		
5-GW-WP3	06/15/89	WATER	13726015		X		
2-GW-WP6	06/15/89	WATER	13726016	X			X
2-GW-WP9	06/15/89	WATER	13726017	X			X
2-GW-WP10	06/15/89	WATER	13726018	X			X
FIELD BLANK	06/15/89	WATER	13726019	X	X		X
EQUIPMENT BLANK	06/15/89	WATER	13726020	X	X		X
TRAVEL BLANK	06/15/89	WATER	13726021	X	X		X
MATRIX SPIKE	06/15/89	WATER	13726M22	X	X	X	
MATRIX SPIKE DUP.	06/15/89	WATER	13726D23	X	X	X	
3E-GW-WP6	06/16/89	WATER	13727001			X	
4-GW-WP6	06/16/89	WATER	13727002			X	
1-GW-WP2	06/16/89	WATER	13727003			X	
8-GW-WP1	06/16/89	WATER	13727004			X	
FIELD BLANK	06/16/89	WATER	13727005			X	
EQUIPMENT BLANK	06/16/89	WATER	13727006			X	
TRAVEL BLANK	06/16/89	WATER	13727007			X	
MATRIX SPIKE	06/16/89	WATER	13727M08			X	
MATRIX SPIKE DUP.	06/16/89	WATER	13727D09			X	
3E-GW-WP1	06/08/89	WATER	23446001	X			
3E-GW-WP2	06/08/89	WATER	23446002	X			
3E-GW-WP3	06/08/89	WATER	23446003	X			
3E-GW-WP4	06/08/89	WATER	23446004	X			
3E-GW-WP5	06/08/89	WATER	23446005	X			
3E-GW-WP7	06/08/89	WATER	23446006	X			
3E-GW-WP8	06/08/89	WATER	23446007	X			
3E-GW-WP9	06/08/89	WATER	23446008	X			

a Volatile Halocarbons/Aromatics

b Volatiles (GC/MS)

c Polynuclear Aromatic Hydrocarbons

d PCB

e Semivolatiles

f EDB

g Priority Pollutant Metals

h Lead

i Total Suspended Solids

j Total Organic Carbon

Table 1.1 (Continued)

	Date	Sample	Lab	Analytical Method
Field Sample	Sampled_	<u>Matrix</u>	<u>Number</u>	<u>abcdefghi</u> j
3E-GW-WP10	06/08/89	WATER	23446009	X
3W-GW-WP1	06/08/89	WATER	23446010	X
3W-GW-WP2	06/08/89	WATER	23446011	X
3W-GW-WP3	06/08/89	WATER	23446012	X
3W-GW-WP4	06/08/89	WATER	23446013	X
7-GW-WP1	06/08/89	WATER	23446014	X
7-GW-WP3	06/08/89	WATER	23446015	X
7-GW-WP4	06/08/89	WATER	23446016	X
7-GW-WP6	06/08/89	WATER	23446017	X
7-GW-WP7	06/08/89	WATER	23446018	X
4-GW-WP1	06/08/89	WATER	23446019	X
4-GW-WP2	06/08/89	WATER	23446020	X
4-GW-WP3	06/08/89	WATER	23446021	X
4-GW-WP10	06/08/89	WATER	23446022	X
1-GW-WP2	06/08/89	WATER	23446023	X
1-GW-WP10	06/08/89	WATER	23446024	X
1-GW-WP3	06/08/89	WATER	23446025	X
1-GW-WP4	06/08/89	WATER	23446026	X
1-GW-WP5	06/08/89	WATER	23446027	X
1-GW-WP6	06/08/89	WATER	23446028	X
8-GW-WP1	06/08/89	WATER	23446029	X
8-GW-WP2	06/08/89	WATER	23446030	X
8-GW-WP3	06/08/89	WATER	23446031	X
8-GW-WP4	06/08/89	WATER	23446032	X
8-GW-WP10	06/08/89	WATER	23446033	X
6-GW-WP1	06/08/89	WATER	23446034	X
6-GW-WP2	06/08/89	WATER	23446035	X
6-GW-WP3	06/08/89	WATER	23446036	X
5-GW-WP1	06/08/89	WATER	23446037	X
5-GW-WP2	06/08/89	WATER	23446038	X
5-GW-WP3	06/08/89	WATER	23446039	X
FIELD BLANK	06/08/89	WATER	23446040	X
EQUIP.BLANK	06/08/89	WATER	23446041	X X
TRAVEL BLANK	06/08/89	WATER	23446042	X X

a Volatile Halocarbons/Aromatics

b Volatiles (GC/MS)

c Polynuclear Aromatic Hydrocarbons

d PCB

e Semivolatiles

f EDB

g Priority Pollutant Metals

h Lead

i Total Suspended Solids

j Total Organic Carbon

Table 2.1 - Holding Time Limits

	Extraction					
Analysis	Method	Water	Soil	Analysis		
PNAs	610/8100	7 days	14 days	40 days		
PCBs	608/8080	7 days	14 days	40 days		
Volatiles	624/8240	-		14 days		
Volatiles	601/8010	_	-	14 days		
Volatiles	602/8020	-	-	14 days		
Semivolatiles	625/8250	7 days	14 days	40 days		
Metals by GFAA	7000	- *	-	6 mo		
Mercury by GFAA	7470	-	-	28 days		
Metals by ICP	6000	-	-	6 mo		
TOC	415.1/415.2	-	-	-		
TSS	160.2	-	-	-		

Table 2.2 Summary of Acceptable Recovery Ranges for Organic Methods

VOLATILES - EPA METHOD 8240

MS/MSD (% Recovery)	Water	<u>Soil</u>
l,1-Dichloroethene	61-145	59-172
Trichloroethene	71-120	62-137
Chlorobenzene	75-130	60-133
Toluene	76-125	59-139
Benzene	76-127	66-142
Surrogate (% Recovery)	<u>Water</u>	<u>Soil</u>
Toluene	88-110	81-117
4-Bromofluorobenzene	86-115	74-121
1,2-Dichloroethane	76-114	70-121
SEMIVOLATILES - EPA METHOD 8250)	
MS/MSD (% Recovery)	Water	<u>Soil</u>
1,2,4-Trichlorobenzene	39-98	38-107
Acenapthene	46-118	31-137
2,4-Dinitrotoluene	24-96	28-89
Pyrene	26-127	35-142
N-Nitroso-Di-n-Propylamine	41-116	41-126
l,4-Dichlorobenzene	36-97	28-104
Pentachlorophenol	9-103	17-109
Pheno1	12-89	26-90
2-Chlorophenol	27-123	25-102
4-Chloro-3-Methylphenol	23-97	26-103
4-Nitrophenol	10-80	11-114
Nitrobenzene	35-114	23-120
2-Fluorobiphenyl	43-116	30-115
p-Terphenyl	33-141	18-137
Phenol	10-94	24-113
FROM: 2-Fluorophenol	21-100	25-121
2,4,6-Tribromophenol	10-123	19-122
PCB - EPA METHOD 8080		
MS/MSD (% Recovery)	Water	<u>Soil</u>
Aroclor 1260		
Surrogate (% Recovery)	<u>Water</u>	<u>Soil</u>
4-Bromophenyl		

Table 2.2 (Cont'd)

VOLATILES - EPA METHOD 8020

MS/MSD (% Recovery)	Water	<u>Soil</u>
Chloromethane	D-193	D-193
Bromomethane	D-144	D-144
Dichlorodifluoromethane		
Vinyl chloride	D-144	D-144
Chloroethane	46-137	46-137
Methylene chloride	25-162	25-162
Trichlorofluoromethane	21-156	21-156
1,1-Dichloroethene	28-167	28-167
1,1-Dichloroethane	47-132	47-132
trans-1,2-Dichloroethene	38-155	38-155
Chloroform	49-133	49-133
1,2-Dichloroethane	51-147	51-147
l,l,l-Trichloroethane	41-138	41-138
Carbon Tetrachloride	43-143	43-143
Bromodichloromethane	42-172	42-172
1,2-Dichloropropane	44-156	44-156
cis-1,3-Dichloropropene	22-178	22-178
Trichloroethene	35-146	35-146
Dibromochloromethane	24-191	24-191
1,1,2-Trichloroethane	39-136	39-136
trans-1,3-Dichloropropene	22-178	22-178
Bromoform	13-159	13-159
1,1,2,2-Tetrachloroethane	8-184	8-184
Tetrachloroethene	26-162	26-162
Chlorobenzene	38-150	38-150
1,3-Dichlorobenzene	7-187	7-187
1,2-Dichlorobenzene	D-208	D-208
1,4-Dichlorobenzene	42-143	42-143
Surrogate (% Recovery)	Water	<u>Soil</u>
Bromochloromethane		

Table 2.2 (Cont'd)

VOLATILES - EPA METHOD 8020

MS/MSD (% Recovery)	<u>Water</u>	<u>Soil</u>
Tert Butyl Methyl Ether Benzene Toluene Ethyl benzene Xylene Chlorobenzene 1,4-Dichlorobenzene 1,3-Dichlorobenzene 1,2-Dichlorobenzene	39-150 46-148 32-160 55-135 42-143 50-141 37-154	39-150 46-148 32-160 55-135 42-143 50-141 37-154
Surrogate (% Recovery)	<u>Water</u>	<u>Soil</u>
Trifluorotoluene		
PAHs - EPA Method 8100		
MS/MSD (% Recovery)	<u>Water</u>	<u>Soil</u>
Naphthalene Acenaphthylene Pyrene	22-133 33-145 52-115	21-133 33-145 52-115
Surrogate (% Recovery)	<u>Water</u>	<u>Soil</u>
Terphenyl	33-147	
EDB - EPA Method 504		
MS/MSD (% Recovery)	<u>Water</u>	<u>Soil</u>
Ethylene Dibromide Dibromochloropropane 1,2-Dibromomethane	 	
Surrogate (% Recovery)	<u>Water</u>	<u>Soil</u>
Fluorobenzene 1,1,2,2-Tetrachloroethane	 	

^{-- =} Acceptable recovery ranges not established.

TABLE 2.3 SUMMARY OF ACCEPTABLE RECOVERY RANGES FOR INORGANIC METHODS

		Control	Limits
<u>Analysis</u>	Method	<u>Known Ref</u>	<u>Spike</u>
Cyanide	335.3/9010	80-120	75-120CLP
Lead by GFAA	7421	90-110	75-125CLP
Metals by GFAA	7000	90-110	75-125CLP
Metals by ICP	6010	90-110	75-125CLP

Table 2.4 - Semivolatiles - EPA Method 8270

MATRIX: WATER - 13572

-				-														
FIELD 1 SAMPLE 1	COMPOUND/ SAMPLE NUMBER	I DATE DATE SAMPLED EXTRACT	DATE EXTRACTED	EDIANALYZEDI	I DATE I DATE I SAMPLED IEXTRACTEDIANALYZEDI NBZ TARGET I FBP TARGET I (C) RANGE I (C) RANGE	FBP		TPH TARGET	I PHL TARGE (f) RANGE		I ETI TBP TARGET E I (h) RANGE		ACCEPTAI Y) RANGE (2S)	I ACURACY ACCEPTANCE IPRECISION I (WRECOVERY) RANGE I (WRECOVERY) I (2S)	PRECISION // % REL. DIFF.	L LAG	COMMENTS	
<u>-</u> -	MS/MSD DATA (a)	105/26/891	105/26/89105/30/89 106/06/891	168/90/90				-								 - - -		
_		_		_		_	_		_	_	_	_		_				
-	Phenol	_	_	-		_	_		_	_	***	15		_				
-	2-Chlorophenol	_	_	_		_	_		_	_		- 13		-) L	LOW SPIKE RECOVERY	<u>></u>
_	1,4-Dichlorobenzene		_	-		_	_	•	_	_	_	1 82		_	28	-		
₹	in-nitroso-di-n-propylamine	-	_	-		_	-	•	_	_	_	109	9 41-116	116 116	38	- ~		
	1,2,4-Trichlorobenzene	_	_	-		_	-		_	_	_	1 75	5 39-98	_	28	_		
-	14-Chloro-3-methylphenol	_	_	_		_	~	•	_	_	_	. 28	8 23-97	_	42			
-	Acenaphthene	_	_	_		_	_	-		_	_	87	7 46-118	_	31			
-	4-Ni tropheno l	_	-	_		-	_	-		-	_	- 13	3 10-80	0 1 83	90	- x	HIGH SPIKE RECOVERY	'RY
-	2,4-Dinitrotoluene	_	_	_		_	_			_	-	98	5 24-96		38			
-	Pentachlorophenol	_		_		-	_	_		_	_	-	9 9-103	03 83	1 50	1	LOW SPIKE RECOVERY	خ
-	Pyrene	_	_	_		-	_	_		_	_	1 78	8 26-127	_	31	_		
-		_	-	-		_	_	_		_	_	-		-		_		
	SAMPLE NUMBERS							_										
	13572M26	105/26/891	05/26/89105/30/89 106/06/891	68/90/90	13 35-1141	141 87	43-116	28 33-141	16 15-103	3 10 21-100	00 15 10-123	23 (
WSD	13572027	105/26/891	05/26/89105/30/89 106/06/891 118	168/90/90			_			_	92					_		
-		_	_	_		-	_	_		_	_	_		_		_		
R1C 1	13572018	105/26/891	05/26/89105/30/89 106/06/891 111	168/90/90	Ξ	66	_	48	66	8.5	101	_				-		
R2C 1	13572014	105/26/891	05/26/89105/30/89 106/06/891 112	68/90/90	112	1 89	_	34	109	1 97	- 86	_		_		_		
R3C	13572008	105/26/891	05/26/89105/30/89 106/06/891	168/90/90	==	1 98	_	68	96	88	114	_				_		
R4C	13572004	105/26/89105/30/89		68/90/90	94	1 90	_	61	86	1 90	1 80	_		-		_		
R4C-DL	13572004D	105/26/89105/30/89		168/90/901	117	94	_	7.2	113	1 94	121			_		_		
R4C-RD	13572004RD	105/26/891	05/26/89105/30/89 106/07/891	168/10/90	٥	۵ -	_	٥	۵	α -	Δ -	_		_		_		
R5C	13572023	105/26/89105/30/89	05/30/89	106/06/891		<u>.</u>	_	•	•	•	•	_		_		_		
RINSEBLKI	13572024	105/26/891	05/26/89105/30/89 106/06/891	168/90/90	108	1 90	_	80	92	1 70	1 87	_		_		_		
ISITE4_R	*13572020R	105/26/89105/30/89		106/07/89	100	1 72	_	10	96	1 87	1 77	_		_		_		
SITE4 OWI	13572020	105/26/89105/30/89		106/06/891	86	1 72	_	7	8.4	7 -	1 76	_		_		- - -	LOW BN SURROGATE REC	EC
TR (PBLK	13572025	105/26/89	05/26/89105/30/89 106/06/891	168/90/90	96	177	_	7.5	96	. 81	96	_		-		_		
SBLKW	W05318B1	 (H) 	105/30/89 106/06/891	168/90/90	85	1 79	_	74	94	1 74	68	-		_		_		
SBLKW2	W0531982	- (H)	105/30/89 106/02/891	168/10/90	66	1 102	_	106	94	1 87	1116			_		_		
-		_	_	_			_	_			_	_		_		-		

 (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.
 (b) MB2 - Nitrobenzene
 (c) FBP - 2-Fluorobiphenyl
 (d) TPH - Terphenyl
 (e) PHL - Phenol
 (f) 2FP - 2-Fluorophenol
 (g) TBP - 2.4.6-Tribromophenol
 (h) Blank data is supplied for each day of extraction. FOOTNOTES:

Table 2.5 - Semivolatiles - EPA Method 8270

MATRIX: SOIL - 13572

	•		-										1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
FIED I COMPOUND/	I DATE	DATE DATE	DATE 1	_	-	-	-	_	_	ACCURACY ACCEPTANCE IPRECISION	CCEPTANCE		PRECISION		
SAMPLE I SAMPLE POINT I NUMBER	SAMPLED	EXTRACTED	ANALYZEDI	SAMPLED EXTRACTED ANALYZED NBZ TARGET FBP	FBP TARGET (C) RANGE		TPH TARGET! PHL TARGET! 2FP TARGET! TBP (d) RANGE! (f) RANGE! (h)	I 2FP TARGET (g) RANGE	TARGETI 2FP TARGET! TBP TARGET !(#RECOVERY) RANGE ! (g) RANGE ! (h) RANGE !	(%RECOVERY)	RANGE (2S)	(%RECOVERY)	* REL. DIFF.	IFLAGI	COMMENTS
MS/MSD DATA (a)	-	 05/26/89 06/05/89 106/07/89	168/20/901			-			-					_	_
	-	_	_	_						ć	90		u		AGAMODE A SAIGS HOID
l Phenol	_	_	-		_	_	_	_	_	96	76-90	- ·	ი -	<u>.</u>	I HIGH SPINE RECOVER
2-Chlorophenol	_	_	_		_	_	_		_	92	25-102	88	₹ '		
1.4-Dichlorobenzene	le l	_	_		_	_	_	_	_	83	28-104	80	4	_	
IN-Nitroso-di-n-propyfamine	faminef	_	-		_	_	_	_	_	66	41-126	93	9	_	_
i 1.2,4-Trichlorobenzene	zene I	_	_		_	_	_	_	_	85	38-107	74	-	_	_
14-Chloro-3-methylphenol	for	_		-	_	-	_	_	_	103	26-103	96 1	7	_	_
Acenaphthene	_	_	_	-	_	_	_	_	_	98	31-137	68	0	_	
1 4-Ni tropheno!	_	_	_	-	_	_	_	-	_	110	11-114	102	•0	_	
2,4-Dinitrotoluene	- H	_	_		_	_	_	_	_	52	28-89	62	- 18	_	_
Pentachloropheno!		-	_		_	_	-	_	_	16	17 - 109	83	6	_	_
Pyrene	-	_	-		_	-	_	_	_	85	35-142	82	4	_	_
_	_	_			_	_	_	_	_			_		_	_
SAMPLE NUMBERS	_	_	_		_	_	_		_			_		_	_
_		_	_		_	_		_	_			_		_	_
R1C_MS 13572M29	105/26/89	05/26/89106/05/89 106/07/891 95	106/07/891	95 23-120	1 94 30-115	1 87 18-137	_	1 97 25-1211 91	11 91 19-122			_		_	
R1C_MSD 1 13572D30	105/26/89	05/26/89 06/05/89 06/07/89 92	106/0/901	92	1 92	85	101	95	74						
_	_	_	_		_	_	_	-	_					_	
13572016	105/26/89	05/26/89106/05/89	106/07/89 94	94	06	8.4	66	1 97	- 81			_		_	
13572017	105/26/89	105/26/89105/30/89	106/02/891	26	107	107	1 89	1 97	100	_		_		_	
13572015	105/26/89	05/26/89 05/30/89	106/02/891	102	106	96	1 92	101	108					_	_
13572012	105/26/89	05/26/89105/30/89	106/02/891	102	96	1 93	104	86	103	_		_		_	
13572013	105/26/89	105/26/89105/30/89 106/05/891	106/02/89	68	1 86	- 85	- 81	68 1	13	_		_		_	_
13572011	105/26/89	105/26/89105/30/89	106/02/89	85	1 92	1 79	1 87	1 97	1 16	_		_		_	_
13572006	105/26/89	05/26/89 05/30/89 06/01/89	106/01/891	82	80	181	06	- 83	1 116	_		_		_	_
13572007	105/26/89	05/26/89105/30/89	106/02/89	102	1 97	86 !	100	1 97	108	_		_		<u>.</u>	_
13572005	105/26/89	05/26/89105/30/89	106/02/891	79	1 93	1 80	06	101	1 70	_		_		_	_
13572002	105/26/89	05/26/89105/30/89	106/02/89	57	1.74	85	1 80	1 78	1 105	_		_		_	_
13572003	105/26/89	05/26/89105/30/89	106/02/89	85	100	06	1 93	1 103	76 1	_		_		_	_
13572001	105/26/89	105/26/89105/30/89 106/05/891 103	106/02/891	103	106	1 92	06	1 97	1 78	_		_		_	_
13572022	105/26/89	105/26/89105/30/89 106/05/891	106/02/891	62	106	88	62	96	96			~			_
SiTE_1_C 13572009	105/26/89	105/26/89105/30/89 106/05/891	106/02/891	88	86	1 86	85	1 92	109			_			_
SITE_1_M 13572010	105/26/89	05/26/89105/30/89	106/02/891	88	68 1	82	1 82	1 9 1	88	_		_		_	
ISITE_4_0 13572019	105/26/89	105/26/89105/30/89	106/02/891	107	125	100	106	119	1 121	_		_		_	_
SBLKS i S0530981	- E	105/30/89	106/01/891	65	- 65	1 73	1 78	1 7 1	1831	_		_		_	_
SBLKS2 \$0530981	(h)	105/30/89	105/30/89 106/05/891	84	1 80	82	83	8 1	06					_	_
SBLKS4 S0530982	9	105/30/89	105/30/89 106/05/891	82	888	1 95	1 79	1 91	- 83	_		_		_	_

(a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.
(b) NB2 - Nitrobenzene
(c) FBP - 2-Fluorobipheny!
(d) TPH - Terpheny!
(e) PHL - Pheno!
(f) 2FP - 2-Fluoropheno!
(g) TBP - 2.4.6-Tribromopheno!
(g) TBP - 2.4.6-Tribromopheno! FOOTNOTES:

Table 2.6 - Semivolatiles - EPA Method 8270

FIELD I		-				SURR	OCATE (SURROGATE COMPOUNDS	S - % RECOVERY	COVERY		•			≛ .	IMATRIX SPIKE DATA	E DATA	IDUPLICATE M. SPIKE DATI	M. SPIKE	DATI		
SAMPLE 1	COMPOUND/ SAMPLE	DATE SAMPLED E	DATE	I DATE	DATE		TARGET		TARGET	TPH TARGET! PHL TARGET! 2FP TARGET! TBP TARGET! (*RECOVERY)	- FH -	TARGETI	2FP TARGE	TI TBP 1	TARGET 10	ACCURACY %RECOVERY]	ACCEPTANC RANGE	ACCERACY ACCEPTANCE PRECISION (%RECOVERY) RANGE (%RECOVERY)	, E.	S - FLAG	- 5	COMMENTS
POINT	NEWBER .			- :		ê <u>;</u>	(b) RANGE (C)	(3)	RANGE 1	RANGE I (d) KANGE I (g) KANGE I (h)		RANGE	(g) RANG		KANGE		(25)		DIFF.	- !	- <u>i</u>	,
-	MS/MSD DATA (a)	≱	½	-	∌			_	_		_	_		-	-			_		_	_	
	Lonada															ž	26.00		47			
	2-Chlorophenol							-	-							ź	25-102	. ₹	2	-		
-	1,4-Dichlorobenzene	_		_		_		-	-		-	-		_	-	ž	28-104	¥Z	ž	-		
ż	IN-Ni troso-di-n-propylamine	-	_	_		_		_	-		_	-		_	-	ž	41-126	ž –	ž	-		
. -	1,2,4-Trichlorobenzene	_	_	_		_		_	-		_	-		_	-	ž	38-107	\$	ž	-	-	
-4	14-Chloro-3-methylphenol	_	_	_		_		_	-		_	-		_	-	ž	26-103	¥ Z	ž	-	_	
_	Acenaphthene	_	_	_		_		_	-		_	-		_	-	ž	31-137	¥ Z	ž	-	_	
	4-Ni trophenol	_	_	_		_		_			_	-		_	-	ž	11-114	*	ž		-	
-	2,4-Dinitrotoluene	_	_	-		_		_	_		_	-		_	-	ž	28-89	ž	ž		_	
-	Pentachlorophenol	_	_	-		_		-	-		_	-		_	-	ž	17 - 109	ž	Ź	-	_	
-	Pyrene	_	_	_		_		-	-		_			_		2	35-142	¥Z	₹	-	-	
-		_	_	_		_			_		_	-		_	-			_		-	_	
-	SAMPLE NUMBERS	_	_	_		_			-		_	-			-			_		-		
-"		_	_	_		_		_	-		_	-			-			_		-		
-	WS	_ ≨ _	≱ -	_	ź	≨ 	23-120	≨ –	30-115	NA 18-137	≨	24-113! NA		25-1211 NA 1	19-122			_		-	_	
-	WSD	- ≨ -	ž	_	∌	≨ –		≨ 	_	₹	≱ -	_	₹	≨ -	-			_		-	_	
-		_	_	_		_		_	-		_	-		_	-			_		_	_	
-	13676017	106/07/89	06/07/89 06/13/89 06/20/89 89	106,	/20/89	89		- 88	_	89	- 89	_	85	66 -	_			_		-	_	
	13676010	106/07/89	106/07/89 06/13/89 06/20/89 91	106,	/20/89	16 10		06	-	80	19	_	06	100	-			_		-	-	
-	13676009	106/07/89	106/07/89106/13/89 106/20/891	106/	/20/89	16 16		06	-	78	06	-	83	- 91	_			_		-	_	
1 6-8	13676019	106/07/89	106/07/89106/13/89 106/20/891	106	/20/89	94		84	-	96	187	_	82	105	-			_		-	_	
-	50613981	(E)	(h) 106/13/89 106/20/891 95	106	/20/89	66		1 93	_	96	1 92	-	98	86	-			_		_	-	

 (a) watrix Spike/watrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.
 (b) NBZ - Nitrobenzene
 (c) FBP - 2-Fluorobiphenyl
 (d) TPH - Terphenyl F00TN0TES:

(b) NBZ - Nitrobenzene
(c) FBP - 2-Fluorobiphenyl
(d) TPH - Terphenyl
(e) PHL - Phenol
(f) 2FP - 2-Fluorophenol
(g) TBP - 2.4.6-Tribromophenol
(h) Blank data is supplied for each day of extraction.

Table 2.7 - Semivolatiles - EPA Method 8270

MATRIX: WATER - 13727

MYTE 10 MAKE				_	ISURROGATE COMPOUNDS		N N C	% RECOVERY		-		. WA .	MATRIX SPIKE DATA						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Section Sect		DATE I	DATE	DATE I	I I NBZ TARGET	: -		H TARGET!	PHL TARGE	I I 2FP TARGET	I FI TBP TAF	AC AC SGET 1 (%R	CURACY A ECOVERY)	CCEPTANCE RANGE	IPRECISION		. ∃.	- _{[0}	COMMENTS
Section Sect					(b) RANGE	- ;		d) RANGE I	(f) RANGE		- :	ANGE -		(2S)		DIFF.	- !	- !	
Petron 1 - Call cooperation		106/16/8910	06/20/89	106/26/891		-					_	-			_		-	_	
		_		_	_	_	-	_		_	_	-			_		- :	_	
2-chiloropatenei 1 1 1 1 1 1 1 1 1	1 Pheno!	_		_	_	_	_	_		_	_	-	0	12-89	0	0	_	의 ·	SPIKE RECOVERY
1.400400000000000000000000000000000000	1 2-Chlorophenol	_		_	_	_	-	-		_	_		81	27 - 123	55	38	_	_	
	1 4-Dichlorobenzene	_		_	_	_	-	_		_	_	-	11	36-97	9.2	-	-	_	
1.2.4-71(chlochenterer 1,2.4-71(chlochenterer 1,2.4-71(chlochentere	N-Ni troso-di-n-broby jamine	-		_	_	_	**	_		_	_	-	107	41-116	1112	-5	-	_	
Accomplished 1 1 1 1 1 1 1 1 1	1 2 4-Trichlorohenzene	_		_	_	_	-	_		_	_	-	7.8	39-98	1 81	-	-	_	
4. Acemaphthene 4. Acemaphthene 5. Acemaphthene 5. Acemaphthene 6. Acemaphthen	14-Chloro-3-wethylphenol			_	-	_	-	-		_	_	-	92	23-97	1 97	-5	-	_	
2.4-Olittoroblemol 10, 10, 10, 10, 10, 10, 10, 10, 10, 10,	*Cenanhthene	_		_	-	_	-	-		_	_	-	92	46-118	88	4	-	-	
2Dinitrobleme 1 1 1 1 1 1 1 1 1	4-Ni tropheno	_		_	_		-	_		_	_	-	103	10-80	1 92	Ξ	~	Ξ.	IGH SPIKE RECOVERY
SAMPLE NAMBERS	1 2 4-Dinitrotoluene	_		_	_	-	-	_		_	_	-	86	24-96	1 85	-	-	_	
SAMPLE NAMBERS	pentachlorophenol	_		_	_	_	-			-	_	_	06	9-103	1 80	12	-	-	
13727003 106/16/99106/20/89 145 155 144 86 43-116 82 33-14 8 10-94 80 21-100 94 10-133 10-14	ace and	_		_	_			-		_			7.4	26-127	1 75	-	-		
13727003 106/16/89106/20/89 115 15 16 17 16 17 16 17 17 17				_	_	_	-	_		_	_	-			_		-	_	
13727009 106/16/49106/20/49 106/26/691 115 35-114 86 43-116 82 33-41 8 10-44 80 21-100 94 10-123 1 L II ACID FRA 13727009 106/16/49106/20/49 106/26/691 115 35-114 86 43-116 82 33-41 8 10-44 80 21-100 94 10-123 1 L II ACID FRA 13727009 106/16/49106/20/49 106/26/691 17	SAMPLE NUMBERS	_		_	_	_	-	_		_	_	-					-	_	
13727009 106/16/89106/20/89 105/26/89 115 15 14 16 17 18 10 - 94 18 0 21 - 100 94 10 - 123 1 1 1 1 1 1 1 1 1	_	_			_	_	-	-		_		_			_		_ :	_ :	
13727003 106/16/89 06/20/89 115 187 76 183 170 183 170 183 170 183 170 183 170 183 170 183 170 183 184 184 185 184 185		106/16/891	68/02/90	106/26/89			43-1161 8			80	94	0-1231			_			- V	ID FRACILION SURR
13727001 106/16/99106/20/89 106/26/89 97 78 14 75 71 69 1 1 1 1 1 1 1 1 1		106/16/89	06/20/89	106/26/89	1115	1 87	1 7	- 9	3	1 70	83	-			_		-	1 40	ID FRACITON SURK
13727003 106/16/89 06/26/89 97 78 14 175 71 169 19 19 19 19 19 19	_	_		_	_	_	_	-		_	_	-			-		-	_	
13727001 106/16/99106/20/89 106/26/891 112 185 170 186 82		106/16/891	06/20/89	106/26/89		1 78	-	-	7.5	171	69	-			_		-	_	
13727002 106/16/89106/20/89 106/26/891 92 178 167 183 176 19 19 19 19 19 19 19 1		106/16/89	06/20/89	106/26/89		1 85	1 7.	- 0	Ξ	1 86	82	_			_		_	17 VCI	ID FRACTION SURR
13727004 106/16/89106/20/89 106/26/89 10 71 144 181 76 72 1 1 1 1 1 1 1 1 1	13727002	106/16/89	06/20/89	106/26/89		1 78	-	7	83	1 78	1 76	_			_		-	_	
13727006 106/16/89106/20/89 106/26/89 96 179 177 171 171 171 171 171 171 172	13727004	168/91/901	06/50/89	106/26/89		1 7 1	-	-	1.00	1 76	1 72				_		_	11 B/A	N FRACTION SURR .
13727005 106/16/89 106/20/89 106 179 177 178 174 174 1 1 1 1 1 1 1 1 1	13727006	106/16/891	06/20/89	106/26/89		- 83	-	9	83	1 77	177	-			_		-	_	
13727007 106.16/89 107 85 84 180 177 83 1 1 1 1 1 1 1 1 1	13727005	106/16/89	06/20/89	106/26/89		1 79	1 7	7	7.8	1 74	1 74	-			_		-	_	
W06209B1 (h) 106/20/89 107 179 181 173 165 175 1 1 1 1 1 1 1 1 1	20070761	106/16/891	06/06/90	106/26/89		- 85	-	4	80	1 77	- 83	-			_		-	_	
(a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date. (b) MBZ - Nitrobenzene (c) FBP - 2-Fluorobiphenyl (d) TPH - Terphenyl (e) PHL - Phenol (i) 2FP - 2-Fluorophenol (j) 18P - 2-4,6-Tribromophenol (j) 18P - 2-4,6-Tribromophenol (i) 18P - 2-4,6-Tribromophenol (ii) 18P - 2-4,6-Tribromophenol (iv) 18 - 2-4,6-Tribromophenol		(h)	68/02/90	106/26/89		1 79	-	-	73	65	1 75	-			_		_	_	
(a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date. (b) NB2 - Nitrobenzene (c) FBP - 2-Fluorobipheny! (d) TPH - Terpheny! (e) PHL - Pheno! (f) 2FP - 2-Fluoropheno! (g) TBP - 2.4.6-Tribromopheno! (h) Blank data is supplied for each day of extraction. (i) Value was not reported by the laboratory.	-			_	: _	_	-			_	_	-			_		_	-	
(a) (b) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d		# # # # # # # # # # # # # # # # # # #	# # # # # # # # # # # # # # # # # # #	H H H	# # # # # # # # # # # # # # # # # # #		. 11 . 11 . 11 . 11 . 11 . 11	# # # # # #		H H H H H H H		# # # # # # # # # # # # # # # # # # #	***************************************		8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		11 11 11 11 11	H H H	
	(a)	x Spike Dup	olicates (.wS/wSD) s.	amples are	run every	20 sampl	es regard	less of ana	lysis date.									
		eny I																	
	2FP -	10																	
	TBP -	nophenol																	
		lied for ea	ach day of	extracti	on.														
		rted by the	a laborato	ry.															
		(a) (b) (c) (d) (d) (d) (d) (e) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e	(a) (b) (c) (d) (d) (d) (d) (e) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e	(a) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	(a) (b) (c) (d) (d) (d) (d) (e) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e	(a) (b) (c) (d) (d) (d) (d) (e) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e	(a) (b) (c) (d) (d) (d) (d) (e) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e	(a) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	(a) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	COMPODADA NAMER NAMER SAMPLE SAMPL	COMPODADA NAMER NAMER SAMPLE SAMPL	COMPODADA NAMER NAMER SAMPLE SAMPL	SAMPLE SAMPLE DATE DAT	SAMPLE SAMPLE DATE DAT	COMPOSED DATE DAT	COMPOSED DATE DAT		Substituting Date Composed Def	
Table 2.8 - Volatile Organic Compounds - EPA Method 8024

MATRIX: WATER - 23529

	-		ns.	SURRO	ISURROGATE COMPOUNDS - % RECOVERY	SONDO	- % RECOV			MATRIX SPIKE DATA	: DATA	IDUPLICATE	IDUPLICATE M. SPIKE DATA I	DATA I		
FIELD			DATE		-		-		_	I ACCURACY ACCEPTABLE I	ACCEPTABLE		PRECISION	- - - -	- -	
SAMPLE	SAMPLE	I SAMPLED	SAMPLED ANALYZED D8 TARGET 1,4-B TARGET D4	- D8	TARGET !	1,4-8	TARGET	D4	TARGET	TARGET ! (%RECOVERY)	RANGE	I % RECOVERY		% REL. IFLAGI		COMMENTS
POINT	NUMBER			9	RANGE (C)		RANGE 1 (d)	(p)	RANGE	_	(25)	_	DIFF.	-	_	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	MS/MSD DATA (a) 0	06/15/89 06/22/89		<u> </u>		1	- -						t t t t	- -	<u>:</u> -	
	_	_	_	_	_		-		-	_		_		-	-	
	1 1,1-Dichloroethene	_	_	_	_		-		_	132	61-145	_	96	<u>-</u>	-	
	Trichloroethylene	_	_	_	_		-		-	105	71-120	_	06	-	-	
	Benzene	_	_	_	-		-		_	103	76-127	_	88	=	-	
	1 Toluene	_	_	_	_		_		_	117	76-125	_	93	- 61	-	
	Chlorobenzene	_	_	_	-		-		_	102	75-130	_	86	13 –	-	
	_	_	_	_	-		-		_	_		_		-	-	
	I SAMPLE NUMBERS	_	_	_	-		-		_			_		-	-	
	_	_	_	_	-		-		_			_		_	-	
3E-6	1 67618	1 06/15/89	06/15/89 06/22/89	101	88-110	4	86-1151 100 76-1141	100	76-114			_		-	-	
3E-6_R_DL	1 67618_R_DL	1 06/15/89	06/15/89 06/23/89	06	_	112	-	103	_			_		-	-	
! METHOD BLANK !	1 2352982	2	1 06/22/89	46	_	46	-	46	_			_		-	_	
I METHOD BLANK I	1 2352981	ž	06/23/89	06	-	Ξ	-	102	_			_		-	-	
	_	_	_		-		-		•					٠		

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

(b) D8 - Toluene
 (c) 1.4-8 - 1.4-Bromofluorobenzene
 (d) D4 - 1.2-Dichloroethane

Table 2.9 - Volatile Organic Compounds - EPA Methods 8010

MATRIX: WATER 13572

E C N C S N T T	COMPOUND/ SAMPLE NUMBER MS/MSD DATA (a) Chloromethane Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane	DATE SAMPLED	I DATE I	(%RECOVERY) (b)	TARGET RANGE	SPIKE RESULT (ppb)	ACCURACY // (%RECOVERY)	RANGE (2S) D-193	E % RECOVERY	PRECISION % REL. DIFF.	FFLAG I I I I	COMMENTS
SAMPLE POINT	SAMPLE NUMBER MS/MSD DATA (a) Chloromethane Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1.1-Dichloroethane 1.1-Dichloroethane	ISAMPLED	ANALYZED 06/08/89 	(%RECOVERY) (b)		RESULT (ppb) -	(%RECOVERY)	RANGE (2S) D-193	% RECOVERY	DIFF.	! ! ! !	I COMMENTS
POINT	NUMBER MS/MSD DATA (a) Chloromethane Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1.1-Dichloroethane 1.1-Dichloroethane	I 	i i! i06/08/89i	(b)		i i I 23.1 i 20.7		D- 193		15.9	1 	
	MS/MSD DATA (a) Chloromethane Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane		106/08/891			1 20.7						
	Chloromethane Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane	05/26/89 	1 - 1			1 20.7						l 1
E C N C S N T T	Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane	 		 		1 20.7						1
E C N C S N T T	Bromomethane Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane	 		 		1 20.7						1
C N N N N N N	Dichlorodifluoromethane Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane	 		· 					00.0		1	1
N C N T 1	Vinyl chloride Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethane 1,1-Dichloroethane	! ! ! !						D-144 (C)	90.0	14.0		
C i	Chloroethane Methylene chloride Trichlorofluoromethane 1,1-Dichloroethene 1,1-Dichloroethane	1 1 1	! ! ! !						99.5	15.7		! !
3 A 1 1 1 1	Methylene chloride Trichlorofluoromethane 1,1-Dichloroethene 1,1-Dichloroethane	! ! !	i I			23.3	116.5 76.5	D-144 46-137	66.0	14.7		! !
1 1 1 1 1 1	Trichlorofluoromethane 1,1-Dichloroethene 1,1-Dichloroethane	! ! !				1 15.3	97.0	25-162	87.5	10.3		' I
I 1	1,1-Dichloroethene 1,1-Dichloroethane	l I						21-156	45.5	43.1		1
1 1	1,1-Dichloroethane	1				1 14.1	70.5			18.6		1
	*			1		1 17.6	88.0	28-167	73.0	11.5		, 1
1 4	trans-1 2-Dichloroethene	1	1 4			1 20.2	101.0	47-132	90.0			, 1
			1			1 19.0	95.0	38-155	85.5	10.5 17.5		
	Chloroform		1			1 21.1	105.5	49-133	88.5)
	1.2-Dichloroethane					20.8	104.0	51-147	90.5	13.9		1
	*, *, * * * * * * * * * * * * * * * * *	1	1			19.7	98.5	41-138	94.5	4.1		1
	Carbon Tetrachloride	1	1			1 20.5	102.5	43-143	90.0	13.0		1
	Bromodichloromethane	1	}			1 21.0	105.0	42-172	92.5	12.7		1
	1,2-Dichloropropane	1	1	ı		20.5	102.5	44-156	91.5	11.3		1
	cis-1,3-Dichloropropene	1	1	l		1 20.8	104.0	22-178	94.0	10.1		•
	Trichloroethene	1	1	 -		1 20.6	103.0	35-146	90.0	13.5		1
	Dibromochloromethane	1				1 20.8	104.0	24-191	93.0	11.2		1
	1,1,2-Trichloroethane		1			1 20.3	101.5	39-136 22-178	93.0 89.0	8.7 9.6		1
	trans-1.3-Dichloropropene	1				1 19.6	98.0		89.0	10.6		1
	Bromoform	1				1 19.8	99.0 117.5	13-159 8-184	102.5	13.6		1
	1,1,2,2-Tetrachloroethane	1				23.5 22.0	117.5	26-162	98.0	11.5		
	Tetrachloroethene	1	1			1 22.8	114.0	38-150	101.5	11.6		1
	Chlorobenzene	1	1	1		1 27.3	136.5	7-187	115.5	16.7		
	1,3-Dichlorobenzene	1	1	1			126.0	D-208	114.0	10.0		1
	1,2-Dichlorobenzene	,I	1	1		1 25.2	126.0	42-143	114.5	12.3		, 1
	1,4-Dichlorobenzene	,		1		1 25.9	129.5	42-143	114.3	12.3		, 1
I :	A. 1151 F	1		1 1		1						I
	SAMPLE	1	1			1					1	1
					4.53	!					1	1
MS I				NOT REPORTED	(c)						1	
MSD I				INOT REPORTED		1					1	, 1
TRIP BLANK I			106/08/89			1					1	1
-RINSE BLK I			106/08/89			'						· 1
R1C I			106/08/89			1						I
ITE 4-OWS O!			106/08/89			1					1	1
R5C I			106/09/89			1					I	1
R4C I			106/09/89								1 1	LOW SURROGATE RECOVE
R3C	13572008		106/07/89			1					. .	1
R2C	13572014		106/07/89			,					i I	· •
NETHOD BLANK!	06/08/89 (0206) 06/08/89 (1347)		106/08/89								ı	1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8010. Table 3, of Test Methods for Evaluating Solid Waste, SW-846 Manual, third edition.

⁽b) BCM - Bromochloromethane

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

ı				SURROGATE COM								
FIELD			DATE I				ACCURACY			PRECISION		
AMPLE I				(%RECOVERY)			(%RECOVERY)		% RECOVERY			COMMENTS
POINT I	NUMBER		l I	1.7		!(ppb)		(25)		DIFF.		
			 06/09/89			1					-	
i	אואם טבאילע)	1037 207 0 9	007 0 3 7 0 3 1			1						
i	Chloromethane	1	I I			1 1976	79.0	D-193	79.4	0.4	1	
ŀ	Bromomethane	t	1 1	ļ		1 1976	79.0	D-144	75.7	4.3	1	
ŧ	Dichlorodifluoromethane	i		1		1		(c)			1	
1	Viny! chloride	1		l		1 2192	87.7	D-144	80.9	8.0	1 1	
1	Chloroethane	1	1 1	l		1 1514	60.6	46-137	59.0	2.5	1 1	
1	Methylene chloride	i	1	l		1 2117	84.7	25-162	83.3	. 1.7	l t	
1	Trichlorofluoromethane	I	1	ı		1 1187	47.5	21-156	39.0	19.7	1	
1	1.1-Dichloroethene	I	1	Ι.		1720	68.8	28-167	65.2	5.4	1	
1	1,1-Dichloroethane	1	1	I		l 2091	83.6	47-132	82.7	1.2	1	
1	trans-1,2-Dichloroethene	L	1 1			1 1974	79.0	38-155	77.7	1.6	1	
1	Chloroform	1	1 1	l		1 2171	86.8	49-133	84.1	3.2	1	
I	1.2-Dichloroethane	t	1 1	l		1 2156	86.2	51-147	83.3	3.5	1	
1	1,1,1-Trichloroethane	ŧ.	l I	l		1 2224	89.0	41-138	91.5	2.8) [
- 1	Carbon Tetrachloride	i	1	ł .		1 2165	86.6	43-143	83.6	3.6	1	
F	Bromodichloromethane	1	1	ı		1 2274	91.0	42-172	85.8	5.8	1	
t	1,2-Dichloropropane	1	i :	Ī		1 2236	89.4	44-156	86.0	4.0	1	
4	cis-1,3-Dichloropropene	1	}	1		1 2240	89.6	22-178	86.2	3.8	1	
1	Trichloroethene	I	1	İ		1 2193	87.7	35-146	83.5	4.9	1 1	
1	Dibromochloromethane	1	I	l		1 2160	86.4	24-191	85.4	1.1	1 1	
1	1,1,2-Trichloroethane	I	I	I		1 2177	87.1	39-136	84.7	2.8	1 1	
- 1	trans-1,3-Dichloropropene	l	I	ı		I 2162	86.5	22-178	84.0	2.9	1 1	
- 1	Bromoform	t .	I	I		1 2043	81.7	13-159	80.8	1.3	1 1	
1	1,1,2,2-Tetrachloroethane	1	I	l		1 2140	85.6	8-184	84.0	1.9	1 1	
- 1	Tetrachloroethene	ł	I	l		1 2368	94.7	26-162	90.7	4.4	1 1	
- 1	Chlorobenzene	1	1	I		1 2284	91.4	38-150	90.8	0.6	i I	
i	1,3-Dichlorobenzene	1	I	l		1 2908	116.3	7-187	108.4	7.0	1 I	
ı	1,2-Dichlorobenzene	I	ŧ	ı		1 2465	98.6	D-208	105.5	6.8	1	
- 1	1,4-Dichlorobenzene	I	i	l		2690	107.6	42-143	101.9	5.4	l I.	
1		1	:]		1					I I	
	SAMPLE	1	1	! i		1					, l	
MS I	13572M29	105/26/20	106/00/80	INOT REPORTED	(c)	1					, '	
MSD I				INOT REPORTED	(6)	ì					. 1	
			1			1					,	
R1U I			' 06/07/89			1					ı E	
R1C I			06/07/89			1					•	
R1D I			06/07/89			1					i i	
TE 4 OWS OF			106/07/89			1					1 1	
R5D I			06/07/89			1					i i	
R5C I			106/07/89			1					1 1	
R4U I			106/07/89			1					1	
R4C I			106/07/89			1					1	
R4D I			106/07/89			1					1	
R3U I			106/07/89			1					1	
R3C I			106/07/89			1					1 1	
R3D I			106/07/89			1					1	
TE 1-CREEKI			106/07/89			1					1	
TE 1-CREEKI			106/07/89			1					1	
R2U I			106/08/89			1					1	
R2C I			106/08/89			1					1	
R2D I			106/08/89			1					1 1	
THOD BLANK!			106/07/89			1					1	
THOD BLANK!			106/07/89			1					1 1	

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8010, Table 3, of Test Methods for Evaluating Solid Waste. SW-846 Manual, third edition.

⁽b) BCM - Bromochloromethane

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

Table 2.11 - Volatile Organic Compounds - EPA Methods 8010

MATRIX: WATER 13701, 13726

	 			SURROGATE COM							1 1	
FIELD			DATE				ACCURACY A			PRECISION		
SAMPLE	I SAMPLE	SAMPLED	IANALYZEDI	(%RECOVERY)	TARGET	IRESULT	(%RECOVERY)	RANGE	% RECOVERY	% REL.	IFLAGI	COMMENTS
POINT	NUMBER	1	1	(b)	RANGE	l(ppb)		(25)		DIFF.	1 1	
		•				-						
	MS/MSD DATA (a)	106/13/89	106/28/89			1					1 1	
	 Chloromethane	ŀ				1 1 19.1	95.5	D- 193	95.5	0.0	i i	
	Bromomethane	1	1 1			1 23.0	115.0	D-144	112.0	2.6	1 1	
	Dichlorodifluoromethane	1	i 1			1 23.6	118.0	(c)	95.5	21.1	1 1	
	l Vinyl chloride	1	1			1 17.8	89.0	D-144	92.0	3.3	F 1	
	Chloroethane	1	1 1			6.9	34.5	46-137	39.5	13.5	LLI	LOW SPIKE RECOVERY
	l methylene chioride	1	1			1 21.9	109.5	25-162	112.5	2.7	Į I	
	Trichlorofluoromethane	E	1 1			1 25.7	128.5	21-156	105.5	19.7	1 1	
	l 1,1-Dichloroethene	1	ţ			1 22.4	112.0	28-167	101.5	9.8	1 1	
	l 1,1-Dichloroethane	i	1			1 21.9	109.5	47-132	112.5	2.7	1 1	•
	trans-1,2-Dichloroethene	1	t 1			1 22.1	110.5	38-155	111.5	0.9	1 1	
	Chloroform	I .	1			1 21.7	108.5	49-133	112.0	3.2	1	
	l 1,2-Dichloroethane	1	1 1			1 21.4	107.0	51-147	109.5	2.3	l 1	
	1,1,1-Trichloroethane	1	ŧ I			1 21.7	108.5	41-138	122.0	11.7	1 1	
	Carbon Tetrachloride	1	t I			1 22.6	113.0	43-143	103.5	8.8	1	
	Bromodichloromethane	£	1 1			1 22.2	111.0	42-172	99.0	11.4	1 1	
	1,2-Dichloropropane	F	F 1			18.9	94.5	44-156	94.5	0.0	[]	
	cis-1,3-Dichloropropene	I	E 1			1 21.3	106.5	22-178	100.0	6.3	1 1	
	Trichloroethene	1	F 1			1 21.6	108.0	35-146	107.5	0.5	1 1	
	Dibromochloromethane	1	1 1			1 21.4	107.0	24-191	98.0	8.8	1 1	
	1,1,2-Trichloroethane	I .	t i			1 20.4	102.0	39-136	104.5	2.4	1 1	
	trans-1,3-Dichloropropene	E	ŧ I			1 21.2	106.0	22-178	100.0	5.8	1 1	
	Bromoform	i	1			1 21.9	109.5	13-159	103.0	6.1	1 1	
	1,1,2,2-Tetrachloroethane	I	1 1			19.7	98.5	8-184	100.0	1.5	1 1	
	Tetrachloroethene	1	1 1			1 21.5	107.5	26-162	102.5	4.8	1 1	
	Chlorobenzene	1	1 1			1 20.1	100.5	38-150	100.0	0.5	1 1	
	l 1.3-Dichlorobenzene	i	i I			1 19.4	97.0	7-187	93.0	4.2	1 1	
	l 1,2-Dichlorobenzene	4	1 1			1 18.3	91.5	D-208	90.5	1.1	1 1	
	1,4-Dichlorobenzene	1	1 (1 19.6	98.0	42-143	94.0	4.2	i I	
	i	I	1 (1					1 1	
	SAMPLE	1	1 !			1					} 1	
	l .	1	1 1			ŧ					1 1	
				NOT REPORTED	(c)	ŧ					1 1	
MSD				NOT REPORTED		1					1 1	
RAVEL BLANK	•	•	 06/25/89			1					1 1	
2-GW-WP1			106/27/89			1					1	
2-GW-WP1 2-GW-WP2			106/27/89								1 1	
3E-GW-WP6	1 13726001		106/27/89								1 1	
1-GW-WP1A			106/27/89			1					, ,	
2-CW-WP6			106/27/89			1					1	
2-CW-WP9			106/27/89			1					1	
2-CW-WP10			106/27/89			1					1 1	
IELD BLANK			106/27/89			1					1 1	
QUITP.BLANK			06/27/89			1					1	
RAVEL BLANK			106/27/89			1					1 1	
ETHOD BLANK			106/25/89			1					1 i	
ETHOD BLANK			106/27/89			1					1 1	
ETHOD BLANK		. , . ,	106/27/89			i.					. i	
			1			,					, ,	

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA method 8010. Table 3, of Test methods for Evaluating Solid Waste. SW-846 manual, third edition.

⁽b) BCM - Bromochforomethane

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

MATRIX: SOIL 13676

				SURROGATE COA								
FIELD SAMPLE POINT	I SAMPLE I NUMBER			(%RECOVERY)	TARGET RANGE		ACCURACY (%RECOVERY)	RANGE (2S)	% RECOVERY	PRECISION % REL DIFF	FLAGI	COMMENTS
	MS/MSD DATA (a)	06/07/89	06/15/89								! 	
	Chloromethane					2000 1600 2100 1800 1800 1550 3600 2500 2300 2100 2200 2200 2300 2200 2300 2200 2300 2200 2200 2300 2200 2300 2200 2300 2200 2300 80.0 84.0 72.0 144.0 122.0 100.0 92.0 84.0 100.0 88.0 92.0 88.0 92.0 88.0 92.0 88.0 92.0 88.0 88.0 92.0 88	D-193 D-144 (c) D-144 46-137 25-162 21-156 28-167 47-132 38-155 49-133 51-147 41-138 43-143 42-172 44-156 22-178 35-146 22-178 28-186 22-178 8-184 26-162 38-150 7-187 D-208	84 .0 76 .0 80 .0 80 .0 39 .6 148 .0 92 .0 84 .0 100 .0 82 .0 88 .0 12 .0 88 .0 12 .0 88 .0 12 .0 88 .0 108 .0 108 .0 108 .0 109 .0 96 .0	4.9 17.1 4.9 10.5 57.1 19.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 4.4 20.4 5.4 4.7 4.9 3.9 9.0 0.4 3.8		LOW SPIKE RECOVERY	
	SAMPLE	 	! ! !			1	88.0	42-143	92.0	4.4	, , , , , ,	
MS MSD	1 13676M28 1 13676D29		06/15/89	NOT REPORTED NOT REPORTED	(c)	į					1	
3E-SL-WP6-1 3E-SL-WP7-1 3E-SL-WP1-1 3E-SL-WP1-1 3W-SL-WP1-1 3W-SL-WP1-1 4-SL-WP1-1 4-SL-WP1-1 4-SL-WP10-1 4-SL-WP10-1 4-SL-WP10-1 4-SL-WP1-1 1-SL-WP1-1 1-SL-WP1-1 1-SL-WP1-1 1-SL-WP1-1 8-SL-WP1-1	13676002 13676003 13676003 13676003 13676003 13676005 13676006 13676007 13676008 13676009 13676010 13676011 13676012 13676013 13676014 13676015 13676016 13676016 13676017 13676018 13676019 13676019 13676020 13676021 13676020 13676021 13676022 166713/89 (1211) 106713/89 (2227) 106714/89 (0227) 106714/89 (0203) 106715/89 (0003) 106715/89 (0003)	105/07/89 106/07/89	106/13/89 106/13/89 106/13/89 106/13/89 106/13/89 106/13/89 106/13/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89 106/14/89	106 107 100 101 89 93 97 89 86 87 79 92 85 83 81 83 80 82 124 99 97 77								

⁽b) BCM - Bromochloromethane
(c) No acceptable range available
(d) Blank data is supplied for each analysis day.
(e) Method blank used to demonstrate methanol solvent purity.

Table 2.12 - Volatile Organic Compounds - EPA methods 8010

MATRIX: SOIL 13676

				SURROGATE COM								
FIELD			DATE I				ACCURACY /			PRECISION		
SAMPLE				(%RECOVERY)			(%RECOVERY)			% REL.	FLAG	COMMENTS
POINT		1	ı ı	(b)		(ppb)		(25)		DIFF.	1 1	
		106/07/89	 06/15/89			· · -					 	• • • • • • • • • • • • • • • • • • •
	marmad onth (a)	1	1 1			i					1 1	
	Chloromethane	ı	1 1			1 1800	72.0	D-193	92.0	24.4		
!	Bromomethane	1	i i			1 1800	72.0	D-144	80.0	10.5	1	
	Dichlorodifluoromethane	1	1 1			1 2300	92.0	(c)	100.0	8.3		
	l Viny! chloride	1	1 1			1900	76.0	D-144	80.0	5.1		
	Chloroethane	1				560	22.4	46-137	24.0	6.9		
	Methylene chloride	1	1 1			3900	156.0	25-162	160.0	2.5		
	Trichtorofluoromethane	1				1 2100	84.0	21-156	92.0	9.1		
	l 1,1-Dichloroethene	1	l 1			2300	92.0	28-167	92.0	0.0		
	1,1-Dichloroethane	1	1 1			2600	104.0	47-132	108.0	3.8		
	trans-1,2-Dichloroethene	ı	1 1			1 2400	96.0	38-155	100.0	4.1		
	l Chloroform	t .	1			1 2200	88.0	49-133	92.0	4.4		
	i 1,2-Dichloroethane	F	1 1			1 2600	104.0	51-147	108.0	3.8		
	1 1,1,1-Trichforoethane	L	!			1 2600	104.0	41-138	108.0	3.8		
	l Carbon Tetrachloride	1	1 1			1 2200	88.0	43-143	96.0	8.7	t 1	
	l Bromodichloromethane	1	1 1			1 2400	96.0	42-172	96.0	0.0		
	l 1,2-Dichloropropane	1	1 1			2300	92.0	44-156	92.0	0.0	1 1	
	l cis-1,3-Dichloropropene	1	1 - 1			2300	92.0	22-178	92.0	0.0		
	l Trichloroethene	1	1 1			1 2800	112.0	35-146	112.0	0.0		
	l Dibromochloromethane	1				1 2200	88.0	24-191	96.0	8.7		
	l 1.1.2-Trichloroethane	1				1 2800	112.0	39-136	116.0	3.5	1 1	
	trans-1,3-Dichloropropene	1	1 1			1 2100	84.0	22-178	88.0	4.7	1 1	ł .
	l Bromoform	L	1 1			1 2100	84.0	13-159	88.0	4.7		
	l 1.1,2,2-Tetrachloroethane	L	1 1			1 2700	108.0	8-184	108.0	0.0		
	Tetrachloroethene	1	1 1			1 2500	100.0	26-162	104.0	3.9	1 1	
	i Chlorobenzene	1	()			1 2500	100.0	38-150	100.0	0.0		
	1,3-Dichlorobenzene	i	1 1			2500	100.0	7-187	100.0	0.0		l
	1,2-Dichlorobenzene	1	1 1			2400	96.0	D-208	96.0	0.0	l ł	t
	l 1,4-Dichlorobenzene	1	1 1			1 2400	96.0	42-143	96.0	0.0	1 1	
	l	1	1 1			1					1 3	3
	I SAMPLE	I	1 1			1					1 1	1
5-3 MS	 5-SL-WP3-1 MS	106/07/89	 06/15/80	NOT REPORTED	(c)	1					, ! 	'
				NOT REPORTED	,	1					, i	ĺ
2 J MSD			1	KEI OKILD		i						I
5-SL-WP3-1	'		 06/15/89	85		i						I
5-SL-WP3-1			06/15/89			i						l
5-SL-WP3-2			106/15/89			F					· i	I
6-SL-WP1-1			106/17/89			ŀ					, i	I
6-SL-WP1-1			106/15/89			i					1 1	ĺ
ETHOD BLANK			106/15/89			i					; i	ĺ
ETHOU BLANK			106/17/89			1					1 1	I
LITIOU BLANK	1 00/1//09 (1050)	((u)	1	, ,,,,							, ,	I
	1	1	1			1						I
	1 1	1	1									1
	I .	1	1									•

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8010, Table 3, of Test Methods for Evaluating Solid Waste. SW-846 Manual. third edition.

⁽b) BCM - Bromochloromethane

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

MATRIX: WATER 23446

	MATRIX: WATE													
, ± -					SURROGATE COM					========		==== 		
ļ			}									1		
1	FIELD	COMPOUND/	DATE	DATE	I BCM		ISPIKE	ACCURACY	ACCEPTABLE	, F	PRECISION	1	l .	
	SAMPLE				(%RECOVERY)	TARGET		(%RECOVERY)		% RECOVERY	% REL.	IFLA	GI CO	MENTS
Ì	POINT	NUMBER		l	l (b)	RANGE	(ppb)		(25)			Ĺ	t	
1			100,400,400	•	•		-1						-	
1		MS/MSD DATA (a)	106/08/89		1		1							,
i		Chloromethane	1	•	1		l 16.3	81.5	D- 193	78.0	4.4		1	
i		Bromomethane	I	, 1	! 		1 53.3	266.5	D-144	259.5	2.7	ı I K	1	
ı		Dichlorodifluoromethane	I	1			1 27.4	137.0	(c)	121.5	12.0			
ł	1	Vinyl chloride	I	I	I		16.0	80.0	D-144	75.0	6.5		i	
ŀ	1	Chloroethane	1	1	1		18.8	94.0	46-137	92.5	1.6		1	
ļ	1	methylene chloride	1	I	ı		1 32.9	164.5	25-162	153.0	7.2	ΙK	1	
I	4	Trichlorofluoromethane	I	ı	l		1 14.3	71.5	21-156	78.5	9.3	1	1	
1	1	1,1-Dichloroethene	1		l		1 25.4	127.0	28-167	113.0	11.7	ŧ	1	
I		1,1-Dichloroethane	1	f i	l		18.7	93.5	47-132	89.5	4.4	l	1	
I		trans-1,2-Dichloroethene	1		l		1 23.5	117.5	38-155	101.0	15.1	1	1	
ł		Chloroform	1	!	I		17.5	87.5	49-133	88.5	1.1	(1	
1		1,2-Dichloroethane	1	· '	l		1 35.4	177 . 0	51-147	172.5	2.6	K	T	
1		1.1.1-Trichloroethane	1	!	ı		1 22.2	111.0	41-138	110.0	0.9	1	I	
1		Carbon Tetrachloride	1	t :	!		1 16.9	84.5	43-143	43.0	65.1		1	
1		Bromodichloromethane	1	l	!		1 17.7	88.5	42-172	38.5	78.7		1	
1		1,2-Dichloropropane	1	l i	ł		1 16.9	84.5	44-156	82.0	3.0		1	
1			1	 	i I		1 16.7	83.5	22-178	72.5	14.1		1	
		Dibromochloromethane		i .			1 25.1 1 18.8	125.5	35-146	97.5	25.1		1	
į		1,1,2-Trichloroethane		' 			1 21.1	94.0 105.5	24-191 39-136	27.0 103.5	110.7		1	
		trans-1,3-Dichloropropene	, I	I	' 		1 17.1	85.5	22-178	78.0	1.9 9.2		1	
i		Bromoform	1	· 			1 21.8	109.0	13-159	14.5	153.0			
1	1	1.1.2,2-Tetrachloroethane	I	1	l		1 24.4	122.0	8-184	109.0	11.3		i	
ł	1	Tetrachloroethene	I	1	I		1 23.0	115.0	26-162	87.5	27.2		1	
I		Chlorobenzene	I	I I	l		1 23.4	117.0	38-150	102.0	13.7	F	1	
ı	1	1.3-Dichlorobenzene	I		ı		1 24.7	123.5	7-187	95.0	26.1	t	1	
t	ł	t,2-Dichlorobenzene	I	! !	l		1 24.2	121.0	D-208	97.0	22.0	Į.	1	
í	1	1.4-Dichlorobenzene	I	1 1	l		1 24.7	123.5	42-143	94.5	26.6	I	1	
í			I	i (l		1					ı	1	
1		SAMPLE	I	1	İ		1					I	1	
			1				I					I	T	
i	MS I				NOT REPORTED							1	1	
1	MSD I	MSD	106/08/89		NOT REPORTED									
ì	1-GW-WP3 I	23446025	, 106/08/89		92		1					1		
i	1-CW-WP4		106/08/89				;					, 1		
ì	1-GW-WP5		106/08/89				,						1	
1	1-CW-WP6		106/08/89										1	
ı	8-CW-WP1		106/08/89				ŀ					i	1	
ı	8-CW-WP2		06/08/89				1					ł	1	
I	8-CW-WP3	23446031	06/08/89	06/22/89	113		1					I	1	
1	8-GW-WP4	23446032	06/08/89	06/22/89	132		1					ı	i	
I	8-CW-WP10	23446033	06/08/89	06/22/891	97		1					I	1	
١	6-CW-WP1		06/08/89	06/22/891	81		1					I	1	
1	6-GW-WP2		06/08/89				1					I	1	
1	6-CW-WP3		06/08/89				1					1	1	
1	5-GW-WP1		06/08/89				1					l	1	
1	5-GW-WP2		106/08/89				1						1	
	5-GW-WP3		106/08/89				1						1	
	FIELD BLANK I EQUIP.BLANK I		106/08/89 106/08/89		92 96		1					1	1	
	TRAVEL BLANK!		106/08/89				1					' 	1	
	METHOD BLANK!			06/22/89 06/17/89			1					' 	1	
	METHOD BLANK!			06/20/89			1					I	1	
	METHOD BLANK!			06/21/891			1						· 1	
	METHOD BLANK!			06/21/891			1						1	
	METHOD BLANK!			06/22/891	*		1					·		
	METHOD BLANK!			06/22/891			i					ı	1	
	METHOD BLANK!			06/22/89			(+	
ī	ı		1 1				L						1	

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8010. Table 3. of Test Methods for Evaluating Solid Waste, SW-846 Manual, third edition.

⁽b) BCM - Bromochloromethane

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

Table 2.13 (continued) - Volatile Organic Compounds - EPA Methods 8010

MATRIX: WATER 23466

	1			SURROGATE COA							1	l
	1				· · · · · · · · · · · · · · · · · · ·							
FIELD			DATE		T. 0.05.T		ACCURACY		RECOVERY	PRECISION		I COMMENTS
AMPLE			I ANALYZEDI	(%RECOVERY)	TARGET		(%RECOVERY)		M KECUVEKY	DIFF.		COMMENTS
POINT	, tomber	1	 	(b)	RANGE	l(ppb)		(25)			 	,
••••			106/23/891			1					I	I
	I MOVIMOD BATA (U)		1 1			Ī					ı	I
	Chloromethane	I .	ı ı			17.8	89.0	D-193	92.0	3.3	i	1
	1 Bromomethane	ŀ	1 F			1 49.8	249.0	D-144	254.5	2.2	l K	ı
	Dichlorodifluoromethane	1	1 1			1 24.5	122.5	(c)	123.0	0.4	I	1
	Vinyl chloride	1	1 4			1 15.1	75.5	D-144	65.0	14.9	I	1
	Chloroethane	I	1 1			17.8	89.0	46-137	92.0	3.3		I
	! Methylene chloride	1	1 1			1 29.1	145.5	25-162	162.0	10.7		1
	† Trichlorofluoromethane	l	1 1			1 16.5	82.5	21-156	94.5	13.6		
	1,1-Dichloroethene	ŀ	1			23.2	116.0	28-167	104.5	10.4		
	l 1,1-Dichloroethane	1	1 1			1 32.8	164.0	47-132	170.5	3.9		1
	l trans-1,2-Dichloroethene	1	1 1			1 21.1	105.5	38-155	104.5	1.0		1
	Chloroform	1	I I			16.3	81.5	49-133	96.0	16.3		1
	1,2-Dichloroethane	1	I I			1 32.8	164.0	51-147	170.5		I K)
	1 1,1,1-Trichloroethane	I .	I I			1 21.5	107.5	41-138	108.0	0.5		
	Carbon Tetrachloride	1	. !			1 15.6	78.0	43-143	7.0	167.1		
	Bromodichloromethane					1 16.6	83.0 77.0	42-172 44-156	6.5 80.0	170.9 3.8		1
	1,2-Dichloropropane	,				1 15.4	76.5	22-178	19.0	120.4		
	cis-1,3-Dichloropropene	1	, ,			15.3 19.1	95.5	35-146	87.5	8.7		1
	Trichloroethene	1	1 1			1 17.7	88.5	24-191	5.0	178.6		
	Dibromochloromethane 1,1,2-Trichloroethane	1	, ,			1 19.3	96.5	39-136	94.5	2.1		i I
	trans-1,3-Dichloropropene	1	, , I I			1 15.3	76.5	22-178	32.0	82.0		I.
	1 Bromoform	1	1 1			1 20.8	104.0	13-159	5.0	181.7		1
	1 1,1,2,2-Tetrachloroethane	i				1 21.9	109.5	8-184	110.5	0.9	i	L
	Tetrachloroethene	3	1 1			1 19.1	95.5	26-162	87.5	8.7	1	(
	Chlorobenzene	1	1 5			1 20.3	101.5	38-150	93.0	8.7	1	I.
	l 1,3-Dichlorobenzene	1	1 1			1 20.6	103.0	7-187	95.0	8.1	1	1
	1.2-Dichlorobenzene	1	1 4			20.8	104.0	D-208	95.5	8.5	I	1
	l 1,4-Dichlorobenzene	Ţ	1 1			1 20.6	103.0	42-143	96.0	7.0	I	1
	1	I	1 1			I					I	1
	I SAMPLE	1	F 1			1					1	1
	I	1	1			1					ŧ.	1
BE-CW-WP1	23446001	106/08/89	106/17/89	106		1					1	
3E-GW-WP2	23446002	106/08/89	06/17/89	108		ı						1
BE-CW-WP3	1 23446003		106/18/891			1						1
3E-GW-WP4			06/18/89			1					1	1
3E-CW-WP5			106/18/89			1						1
3E-CW-WP7			106/18/89			1					1	1
3E-CW-WP8			106/18/89			1					1	I
3E-GW-WP9			106/20/89			1					i	1
3E-OW-WP10			06/20/89 06/20/89			1					1	T.
3W-GW-WP1	23446010 1 23446011		1106/20/89			i					1	1
3W-GW-WP2 3W-GW-WP3	23446011		106/20/89			i					1	1
SW-GW-WP3	23446012		106/20/89			·					1	t
7-GW-WP1			106/20/89			T.					1	1
7-GW-WP3	23446015		106/21/89			1					I	1
7-GW-WP4			106/21/89			1					1	I
7-CW-WP6			106/21/89			1					Į.	I
7-GW-WP7			106/21/89			1					i.	I
4-GW-WP1			106/21/89			1					}	I
4-GW-WP2		106/08/89	106/21/89	98		1					1	1
4-GW-WP3			0106/22/89			£					I	1
4-CW-WP10		106/08/89	06/21/89	1 94		1					I	I
1-CW-WP2	23446023	106/08/89	0106/21/89	97		ŧ					1	1
	23446024		106/21/89	98							1	i

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8010, Table 3, of Test Methods for Evaluating Solid Waste. SW-846 Manual, third edition.

⁽b) BCM - Bromochloromethane

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

Table 2.14 - Volatile Organic Compounds - EPA Methods 8020

MATRIX: WATER - 13572

	#ATER - 13572 ====================================													_
!				SURROGATE CO	OMPOUNDS	SIMATRIX	SPIKE DATA		IDUPL IC	ATE MATRIX	SPIKE DATA		***************************************	- -
FIELD SAMPLE POINT	COMPOUND/ ! SAMPLE NUMBER	DATE		TFT (%RECOVERY)	TARGET	ISPIKE	ACCURACY (%RECOVERY)	ACCEPTABLE RANGE	ISPIKE		PRECISION		COMMENTS	
1	MS/MSD DATA (a)	105/26/891	06/10/89			1			1	•••••				1
	Tert Buty! Methyl Ether Benzene Toluene Ethyl benzene Xylene Chlorobenzene 1.4-Dichlorobenzene 1.3-Dichlorobenzene		1 1 1 1 1 1 1			1 20.7 12.8 10.8 11.9 12.1 23.4 4.5 (e)	103.5 64.0 54.0 59.5 60.5 117.0 22.5 NA	32-160 (c)	9.9 12.7 13.4 28.8	110.5 53.5 49.5 63.5 67.0 144.0 40.0 NA	6.54 17.87 8.70 6.50 10.20 20.69 56.00 NA	1	LOW SPIKE RECOVERY	
1	SAMPLE	1 i	1			I I			1			1 I		t
I MS I MSD	1 13572M26 1 13572D27		06/10/891	NOT REPORTE		1 1			 			 I I I I		; ;
TRIP BLAN	LK (13572024 13572018	105/26/891 105/26/891 105/26/891	06/06/891 06/06/891	120 118 118		1 1 1			1 1 1) (
ISITE 4-OWS I R5C I R4C	\$ 0! 13572020 ! 13572023 ! 13572004	105/26/891 105/26/891 105/26/891	06/09/87[110 123 112] 			 					
I R3C I R2C IMETHOD BLA	13572008 1 13572014 ANKI 06/06/89 (1935)	105/26/89 105/26/89 (d)		127 103 119		1 1 1			1 1			1 I 1 I 1 I	TOLUENE @ 1 PPB	l l l
IMETHOD BLA			06/08/891 06/08/891	119 110		1 1			1					1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8020, Table 3, of Test Methods for Evaluating Solid Waste, SW-846 Manual, third edition

- (b) TFT Trifluorotoluene
- (c) No acceptable range available
- (d) Blank data is supplied for each analysis day.
- (e) Not resolved by this method, results reported with 601 analysis.

Table 2.15 - Volatile Organic Compounds - EPA Methods 8020

MATRIX: SOIL - 13572

	I			SURROGATE C						TE MATRIX S			
FIELD	COMPOUND/ SAMPLE NUMBER	DATE	DATE ANALYZED	I TFT		SPIKE FRESULT	ACCURACY /	ACCEPTABL	EISPIKE		RECISION % REL.	1 1	
		•	•						-1		·	[]	
	MS/MSD DATA (a)	105/26/89		t .					1				
		1	l			1 0000	112	(c)	1 2600	104	7.4	, ,	
	Tert Butyl Methyl Ether		 	1		1 2800 1 3000	120	39-150		112	6.9		
	Benzene Toluene	1	! [1 3100	124	46-148		104	17.5		
	Ethyl benzene	1				3000	120	32-160		104	14.3		
	Xylene	1	· ŀ			i 2500	100	(c)	1 2300	92	8.3		
	Chlorobenzene	1	,			1 7700	103	55-135		101	1.3		
	1.4-Dichlorobenzene	i		1		1 1800	72	42-143		72	0.0		
	1.3-Dichlorobenzene	1	ı	ı		l (e)	NA.	50-141	l (e)	NA	NA	1 1	
	1,2-Dichlorobenzene	1	ı	I		(e)	NA	37 - 154	(e)	NA	NA	ţ 1	
		1	ı	I		ı			1			1 1	
	I SAMPLE	1	ı	I		ŧ			1			1 1	
	1	•	I	I		1			1			1 1	
MS	I 13572M29	105/26/89	06/10/89	INOT REPORTE	D (c)	I .			1			1 1	•
MSD	1 13572D30			NOT REPORTE		L			1			1 1	
	I .	1	1	I		1			1			1 1	
RIU	13572015	105/26/89	106/07/89	93		L			ŧ			1 1	
R1C	13572016	105/26/89	06/07/89	1 110		1			1			1 1	
R1D	13572017	105/26/89	06/07/89	1 112		4			1			1 - 1	
SITE 4 OWS O	13572019	105/26/89	106/07/89	l 121		Į.			1			1 1	
R5D	1 13572021	105/26/89	106/07/89	114		1			1			1	
R5C	13572022	105/26/89	06/09/89	1 119		1			I			()	
R4U	1 13572001	105/26/89	106/09/89	131		1			1			1 1	
R4C	1 13572002	105/26/89	106/08/89	1 155		1			1			K	HIGH SURROGATE RE
R4D	13572003	105/26/89	106/08/89	130		1			ŧ			1 1	
R3U	13572005	105/26/89	106/08/89			1			ı			1 !	
R3C	13572006	105/26/89	106/08/89	1 117		1			1			1	
R3D	1 13572007	105/26/89				I			1			1	
SITE 1-CREEK		105/26/89				1						1	1
SITE 1-CREEK		105/26/89				1			1			1	,
	13572011	05/26/89				1			1			1	
	13572012	105/26/89				1			1			1	
	13572013	105/26/89				1			1			1	
WETHOD BLANK			106/07/89			1			1			r F	
WETHOD BLANK			106/07/89			1			,				
METHOD BLANK			106/08/89			1			,				
WETHOD BLANK			106/08/89			1			,				
METHOD BLANK	(1 06/09/89 (0935)	(d)	106/09/89	115	*	1						1	
		1	1	1		•						•	

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA method 8020, Table 3, of Test Methods for Evaluating Solid Waste. SW-846 Manual, third edition

⁽b) TFT - Trifluorotoluene

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

⁽e) Not resolved by this method, results reported with 601 analysis.

Table 2.16 - Volatile Organic Compounds - EPA Methods 8020

MATRIX: WATER - 13701, 13726

اا	+SURROGATE COMPOUNDSIMATRIX SPIKE DATA DU										SPIKE DATA	 	1
FIELD I	COMPOUND/	I DATE				•	ACCURACY		•		PRECISION	1	l
SAMPLE I	SAMPLE	ISAMPLED	ANALYZEDI	(%RECOVERY)	TARGET	IRESULT	(%RECOVERY)	RANGE	RESULT 9	RECOVERY	% REL.	IFLAG	COMMENTS
POINT I	NUMBER		l i	(b)		(ppb)		(28)	(ppb)		DIFF.	l	l
	MS/MSD DATA (a)	106/13/89			• • • • • • •				1			1	
1		ţ.	l i			I			l			1	l
	Tert Butyl Methyl Ether	ŀ	1 1			30.9	154.5		3.8	19.0	156.20	IJ,Ŀ,	ILOW RECOVERY & %RS
	Benzene	ı	l I			1 24.3	121.5	39-150	20.3	101.5	17.94	I	I
	Toluene	1	1 1			1 25.0	125.0	46-148	19.1	95.5	26.76	I	l
	Ethyl benzene	t	1 1			26.2	131.0	32-160	15.1	75.5	53.75	l M	POOR PRECISION
I	m- and p-Xylenes	1				1 48.0	120.0	(c)	40.0	100.0	18.18	I	l
1	o-Xylene	1	l (1 23.7	118.5	(c)	16.9	84.5	33.50	I M	POOR PRECISION
1	Chlorobenzene	ı	1 1			1 23.3	116.5	55-135	20.4	102.0	13.27	I	l
	1,4-Dichtorobenzene	1	1 1			1 24.7	123.5	42-143	18.9	94.5	26.61	l	l
1	1,3-Dichtorobenzene	1	1 1			1 24.7	123.5	50-141	18.9	94.5	26.61	I	l
I	1,2-Dichlorobenzene	1	1 1			1 24.2	121.0	37-154	19.4	97.0	22.02	l	Ι .
1		1	l t			1			l			I	I
	SAMPLE	1	1 1			I			I			I	I
	•	1	1 1			1			I			1	I
MS !	13726#22	106/13/89	06/28/89	NOT REPORTE) (c)	1			l .			1	I
MSD i	13726D23	106/13/89	06/28/891	NOT REPORTE)	1			ı			j	l
1			1 +			i			i			i	i
RAVEL BLANK	13701020/23513-1	106/13/89	06/25/89	119		i			ı			ı	I
2-CW-WP1			06/27/89			i			1			1	I
2-GW-WP2			06/27/89			1			1			1	I
3E-GW-WP6			06/27/891			i			I			I	I
1-GW-WP1A	13726005		06/27/891			1			I			I	i
2-GW-WP6	13726016		06/27/891			i			I			, I	' 1
2-GW-WP9		106/15/89				1						· I	· I
2-CW-WP10			106/27/891			1			1			· I	' I
TELD BLANK						1			,				1
QUEEP BLANK			106/27/891			1							! !
•			106/27/891			1			,				! !
RAVEL BLANK			106/27/891			1							l 1
STHOD BLANK!			106/25/891			1							l
STHOD BLANK			106/27/89			1			1				l
SETHOD BLANK	06/27/89 (0354)	(d)	106/27/891 1	96		1			1			ı	ı

fOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA method 8020, Table 3, of Test methods for Evaluating Solid Waste. SW-846 manual, third edition

⁽b) TFT - Trifluorotoluene

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

⁽e) Not resolved by this method, results reported with 601 analysis.

Table 2.17 - Volatile Organic Compounds - EPA Methods 8020

	 	-1		SURROGATE (ATE MATRIX			
FIELD	COMPOUND/		DATE				ACCURACY				PRECISION		
SAMPLE	SAMPLE				TARGET		(%RECOVERY)			% RECOVERY			COMMENTS
POINT	NUMBER	1	1			L(ppb)			l(ppb)			1 1	
		•	1			.	• • • • • • • • • • • • • • • • • • • •	•••••	l			11	
!	MS/MSD DATA (a)	106/07/89		!		1			!			1 1	
	i I Tert Butyl Methyl Ether	1	; []	!		1 2300	92	(c)	1 2300	92	0.0	1 1	
	Benzene	;	, ,			1 2400	96		1 2500	100	4.1		
	Toluene	i		· 		1 2500	100		1 2300	92	8.3		
	Ethyl benzene	1	I I	· 		1 2600	104		1 2600	104	0.0		
	m- and p-Xylenes	` 1	1 i	· 		1 4600	92		1 4800	96	4.3		
	o-Xylene	1		· 		1 2300	92		1 2400	96	4.3		
	Chlorobenzene	i	, . ; .			1 2300	92	55-135		96	4.3		
	1 1,4-Dichlorobenzene	i				1 2200	88		1 2300	92	4.4		
	1,3-Dichlorobenzene		, ; 			1 2300	92		1 2400	96	4.3		
	1,2-Dichlorobenzene	1	, '			1 2300	92	37-154		96	4.3		
	i 1,2-Dicinorobenzene	,				1 2300	74	37 - 134	1	70	4.3		
	SAMPLE		. '										
	GAMPLE											. ,	
MS I	13676M28	106/07/90	1 106/15/801	NOT REPORTE	D (c)	1						, , , ,	
						1							
MSD I	13676D29		1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	NOT REPORTE	υ	1			, ,			1 1	
r ou wor e l	12576004					1							
E-SL-WP6-1		106/07/89											
E-SL-WP6-2		106/07/89											
E-SL-WP7-1		106/07/89							!				
E-SL-WP1-1		106/07/89							!				
V-SL-WP1-1		106/07/89							,				
V-SL-WP5-1		106/07/89							,				
7-SL-WP2-1		106/07/89											
7-SL-WP5-1		106/07/89											
6-SL-WP1-1		106/07/89											
-SL-WP10-1		106/07/89											
4-SL-WP1-2		106/07/89							!				
6-SL-WP2-1		106/07/89		94) :				
4-SL-WP3-1		106/07/89							1				
1-SL-WP1-1		106/07/89				,			•				
-SL-WP10-1		106/07/89											
1-SL-WP2-1		106/07/89							1				
1-SL-WP3-1 1-SL-WP4-1		106/07/89				1			1			1 1	
1-SL-WP4-1		106/07/89				1			,				
8-SL-WP1-1		106/07/89				1		1					
3-SL-WP3-1 1		106/07/89				1							
3-SL-WP4-1		106/07/89		95		1						1	
SL-WP10-1		106/07/89										: 1	
THOO BLANK			06/13/891	96								1	
THD BLK (e)			06/13/891	95		1		١				I .	
THOO BLANK!			06/13/89			1		1				!	
THOD BLANK!			06/14/891	93				!				ł	
THOO BLANK!			06/15/891	106		1		!			ļ	!	
ETHOD BLANK!			06/17/891	96		1		ı				1	
THOO BLANK!	06/18/89 (1222)	1 (d) 1	06/18/891	95		1							

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8020, Table 3, of Test Methods for Evaluating Solid Waste, SW-846 Manual, third edition

⁽b) TFT - Trifluorotoluene

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

⁽e) Method blank used to demonstrate methanol solvent purity.

Table 2.17 (continued) - Volatile Organic Compounds - EPA Methods 8020

		COLUE DATA	ATE WATRIX			SPIKE DATA	2 HATO (V	OHDOL NO	LIDBOCATE C	1.4			
			ATE MATRIX			SPIRE DATA		JMPOUND:		;; ;	-	· 	
	1	PRECISION		ISPIKE	ACCEPTABLE	ACCURACY	SPIKE		TFT	DATE	DATE	COMPOUND/	FIELD I
COMMENTS	FLAGI	% REL.	% RECOVERY	RESULT	RANGE	(%RECOVERY)	RESULT	TARGET	%RECOVERY)	ANALYZEDI	ISAMPLED	SAMPLE	SAMPLE I
	1	DIFF.		i (ppb)	(2S)		l(ppb)	RANGE	(p)	1	1	NUMBER .	POINT I
				1			1			06/10/891	106/07/89	MS/MSD DATA (a)	
	1			l			i			1	1	l	- 1
	1	4.1	100	2500	(c)	96	2400			1	1	l Tert Butyl Methyl Ether	1
	1	3.8	108	2700	39-150	104	2600			1	1	l Benzene	- 1
	1	3.8	108	2700	46-148	104	2600			1	1	l Toluene	1
	1	0.0	112	2800	32-160	112	2800			1	1	l Ethyl benzene	- 1
	1	0.0	100	5000	(c)	100	5000			1	1	l m- and p-Xylenes	1
	1	0.0	100	1 2500	(c)	100	2500			t t	1	l Xylene	- 1
	1	0.0	100	2500	55-135	100	2500			1	1	Chlorobenzene	- 1
	1	0.0	96	2400	42-143	96	2400			l l	1	l 1,4-Dichlorobenzene	- 1
	1	0.0	100	1 2500	50-141	100	2500			1	1	l 1,3-Dichlorobenzene	- 1
	1	0.0	96	2400	37-154	96	2400			1	1	l 1,2-Dichlorobenzene	1
	1			!	!		Į.				1	l	- 1
	1			ł			ı			1	1	SAMPLE	1
	1			1			1			1	1	I	1
	1			1			1	(c)	OT REPORTED	06/15/8911	106/07/89	5-SL-WP3-1 MS	5-3 MS
	1			l			i)	OT REPORTED	06/15/8911	106/07/89	5-SL-WP3-1 MSD	5-3 MSD
	1			1			ı				1	1	1
	1			1			1		108	06/15/891	106/07/89	13676023	5-SL-WP3-1 1
	1			I			į.		109	06/15/891	106/07/89	13676024	5-SL-WP3-2
	1			ł			ţ.		110	06/15/891	106/07/89	13676025	5-SL-WP2-1 i
	1			1			1		95	06/17/891	106/07/89	13676026	6-SL-WP1-1
	1			1			í		106	06/15/891	106/07/89	13676027	6-SL-WP2-1
	1			i .			i		106	06/15/89	(d)	06/15/89 (0409)	METHOD BLANK!
	1			i			ł		96	06/17/891	(d)	06/17/89 (1856)	METHOD BLANK!
	1			į.			ł			1	1	l	1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA Method 8020, Table 3, of Test Methods for Evaluating Solid Waste, SW-846 Manual, third edition

⁽b) TFT - Trifluorotoluene

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

Table 2.18 - Volatile Organic Compounds - EPA Methods 8020

- A - 1	I			SURROGATE C						TE MATRIX S			
FIELD I	COMPOUND/	DATE			T. 005-		ACCURACY				RECISION		COMMENTS
SAMPLE I	I SAMPLE			(%RECOVERY)			(%RECOVERY)			% RECOVERY			COMMENTS
POINT I	I NUMBER	 -	} {	(b)	RANGE	(ppb)		(2S)	(ppb) -		DIFF.	1	
į	MS/MSD DATA (a)	106/08/89		- -		l I			1			t 1	
l I	 Tert Butyl Methyl Ether		l .	! !		1 (1	0.0	(c)	(1	0.0	NA	, ,]	LOW SPIKE RECOVER
	Benzene	i		i		1 20.6	103.0		20.6	103.0	0.0		
	I Toluene	i	ı	1		19.8	99.0		1 18.6	93.0	6.2	1 1	
	I Ethyl benzene	1	I	ı		1 17.4	87.0		1 20.9	104.5	18.3	1 4	
	m- and p-Xylenes	i	I	ı		l 51.1	127.8	(c)	1 35.3	88.3	36.6	1 4	i
	l o-xylene	1	I	ı		20.2	101.0	(c)	1 18.1	90.5	11.0	1 4	
	Chlorobenzene	1	ı	ı		20.3	101.5	55-135		93.0	8.7	1)	ı
	l 1,4-Dichlorobenzene	1	I	ı		20.6	103.0	42-143		96.0	7.0	1)	l
	1 1,3-Dichlorobenzene	1	1	ı		20.6	103.0	50-141		95.0	8.1		I
	l 1,2-Dichlorobenzene			1		20.8	104.0		1 19.1	95.5	8.5		I
	,. 516111010001126116			I		1			1	• • • •		1 1	I
	SAMPLE	,		, I		1			1				ı
) JAMELL	1							1				I
MS I	1 MS	106/08/99	N6/23/80	I NOT REPORTE	D (c)				1			1 1	l
MSD I	i ms			NOT REPORTE					1				l
mau i	ı mau		100/23/69	HOLKEFORIE	U				1			1 1	
3E-GW-WP1 I	l 23446001	106/08/89		i 94					1			, '	·
3E-GW-WP1	1 23446001	106/08/89							, 1				·
	23446002	106/08/89				,			i			1 1	·
3E-GW-WP3 3E-GW-WP4	1 23446003	106/08/89				,			1				·
3E-GW-WP4	1 23446004	106/08/89							i				·
3E-GW-WP7	1 23446005	106/08/89							1			1	[
3E-GW-WP/ 1	1 23446007	106/08/89				1			1				· I
3E-CW-WP9		106/08/89							1			1	·
3E-GW-WP9	· ·	106/08/89											·
3W-GW-WPIU I		106/08/89							1				·
			106/20/89			1			,				· [
3W-GW-WP2			106/20/89										·
3W-GW-WP3 I			106/20/89						1				·
3W-GW-WP4 1	23446013		106/20/89						,				
7-CW-WP1									1				·
7-GW-WP3			106/21/89			1			,				
7-CW-WP4	23446016		106/21/89			+			1				
7-CW-WP6	23446017		106/21/89			t			1				
7-GW-WP7			106/21/89			1			1				· I
4-GW-WP1	23446019		106/21/89			1			1			1 1	, I
4-GW-WP2	23446020		106/21/89			1			1			1 1	1
4-GW-WP3	23446021		106/21/89			1			1				1
4-GW-WP10	23446022		106/21/89			1			1			1	,
1-GW-WP2	23446023		106/21/89			1			1			1 1	! !
1-CW-WP10	! 23446024 !		06/21/89 			1			1			,	1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA method 8020. Table 3, of Test methods for Evaluating Solid Waste. SW-846 manual, third edition

⁽b) TFT - Trifluorotoluene

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

⁽e) Not resolved by this method, results reported with 601 analysis.

MAIKIA. WAII	=======================================												
1	ı		1	SURROGATE C	OMPOUNDS	MATRIX	SPIKE DATA		DUPLIC	ATE MATRIX	SPIKE DATA	I	1
FIELD	COMPOUND/	I DATE					ACCURACY				PRECISION		; }
SAMPLE	I SAMPLE	ISAMPLED	ANALYZED	(%RECOVERY)	TARGET	IRESULT	(%RECOVERY)	RANGE	RESULT	% RECOVERY	% REL.	FLAG	I COMMENTS
POINT	NUMBER	1	i I	(b)	RANGE	l(ppb)			l(ppb)		U	i	1
	MS/MSD DATA (a)	106/08/89	 06/23/89			 						 	/ I
	I	1	1			1			I			I	1
	Tert Buty! Methy Ether	ŧ	I I			30.9	154.5	(c)	1 3.8	19.0	NA	IJ	IHIGH & LOW SPIKE REC
	Benzene	1	I I			1 24.3	121.5	39-150	1 20.3	101.5	17.9	I	t .
	! To luene	ŧ	I I			1 25	125.0	46-148	1 19.1	95.5	26.8	I	1
	l Ethyl benzene	}	I i			1 26.2	131.0	32-160	1 15.5	77.5	51.3	i	1
l	l m- and p-Xylenes	1	I I			1 48	120.0	(c)	1 40.0	100.0	18.2	1	1
I	l o-Xylene	1	I i			1 23.7	118.5	(c)	1 16.9	84.5	33.5	1	1
i	Chlorobenzene	1	L .			1 23.3	116.5	55-135	20.4	102.0	13.3	Į.	I.
į.	l 1,4-Dichlorobenzene	1	1			1 24.7	123.5	42-143	1 18.9	94.5	26.6	1	l .
ı	l 1.3-Dichlorobenzene	1	1 .			1 24.7	123.5	50-141	1 19.0	95.0	26.1	i	L
I	l 1.2-Dichlorobenzene	1	(1		1 24.2	121.0	37 - 154	1 19.4	97.0	22.0	I .	l .
l .	I	1	i	i		1			L			I	1
l .	I SAMPLE	1	i	ı		I			1			1	I
	I	1	ł	ı		1			1			I	I
MS	l MS	106/08/89	106/23/89	NOT REPORTE	D (c)	4			1			L	l .
MSD	l #SD	106/08/89	106/23/89	NOT REPORTE	D	1			1			1	l .
	1	1	1	ı		ŧ			1			t	I
1-CW-WP3	23446025	106/08/89	106/21/89	92		4			1			L	1
1-GW-WP4	23446026	106/08/89	106/21/89	97		1			1			1	I
1-GW-WP5	1 23446027	106/08/89	106/21/89	97		1			1			1	1
1-CW-WP6	23446028	106/08/89	106/21/89	l 96		F			1			1	1
8-CW-WP1	23446029	106/08/89	106/22/89	98		\$			1			1	i
8-CW-WP2	23446030	106/08/89	106/22/89	l 83		ŧ			1			1	l .
8-CW-WP3	23446031	106/08/89	106/22/89	106		ŧ			1			l .	1
1 8-GW-WP4	23446032	106/08/89	106/22/89	75		k .			1			1	1
8-GW-WP10	23446033	106/08/89	106/22/89	90		1			1			1	I
I 6-GW-WP1	23446034	106/08/89	106/22/89	98		I			I			(·	l .
1 6-GW-WP2	23446035	106/08/89	106/22/89	97		I			I			1	I
I 6-CW-WP3	23446036	106/08/89	106/22/89	97		1			1			+	I
1 5-GW-WP1	23446037	106/08/89	106/22/89	98		T			i			1	I
5-GW-WP2	23446038	106/08/89	106/22/89	97		1			I			1	I
5-GW-WP3		106/08/89	106/22/89	97		1			1			ļ	I
FIELD BLANK		106/08/89				1			I			1	I
EQUIP. BLANK		106/08/89				I			I			1	I
TRAVEL BLANK		106/08/89				I			1			ŀ	I .
METHOD BLANK			106/17/89			1			1			1	1
METHOD BLANK			106/20/89			I			I			1	1
METHOD BLANK			106/21/89			I			I			I	I
METHOD BLANK			06/21/89			1			I			1	I
METHOD BLANK			106/22/89			I			1			1	I
METHOD BLANK			106/22/89			1			1			1	l .
METHOD BLANK			106/22/89	i 95		1			1			ļ	1
L	i .	i	1	i		1			1			1	I

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

Acceptable ranges are listed in EPA method 8020, Table 3, of Test methods for Evaluating Solid Waste, SW-846 manual, third edition

⁽b) TFT - Trifluorotoluene

⁽c) No acceptable range available

⁽d) Blank data is supplied for each analysis day.

⁽e) Not resolved by this method, results reported with 601 analysis.

Table 2.19 - PAH Compounds - EPA Method 8100

									IDUPLICATE A			
			1				MATRIX SPIKE					
IELD I				I DATE					EIPRECISION I (%RECOVERY)			COMMENTS
AMPLE I				IANALYZED			(%RECOVERY)					COMMENTS
OINT I	NUMBER					RANGE I		(25)	-1	DIFF.		
									·1		1 1	
,	MS/MSD DATA (a)	106/0//89	100/14/89	100720789		,			1			
,	13676M28,-D29	1 .	1	1	1	'			İ			
, I		1	! !	1	1	,			i		1 1	
,		1	' 1	1		21-1331		(c)	I 71	3	4 1	
		1	1	1		33-145		(c)	1 82	2	· ·	
	,		,		1	52-115		(c)	1 75	7	 	
'	Pyrene	1	,	1	,	32-1131		(0)	1 73	,	1 1	
	12676421 022	,	106/14/80	106/20/80	1				1			
,	13676M31,-D32			106/20/89								
1		1	1		1	21-133		(c)	i 77	6		
		1	1	1	1			(c)	1 77	٥	, ,	
	Acenaphthylene	1	1	1	1	33-145		(c)		5	, '	
	Pyrene		1	1	1	52-1151		(c)	1 78	э	1 1	
						1			1		, ,	
,	SAMPLE NUMBERS								1			
									1			
MS I	13676M28			106/20/89		18-137					1 1	
MSD I	13676D29			106/20/89					,		1 1	
MS1	13676M31			106/20/89					,			
MSD1				106/20/89					1			
ا					1				,		1 1	
-6 1.5				106/19/89					1			
-6 3.51				106/19/89			•		1			
-7 1				106/19/89			1		1			
:-1 I				106/19/89							1 1	
/- 1				106/19/89							t 1	
V-5 I				106/19/89			1		1		1 .	
·2 I				106/19/89					l i		1 1	
-5 1				106/19/89			1		1			
1 SL-W				106/20/89			1		1		1 (
.2 1				106/20/89					1		1 1	
.3				106/20/89			ı		ı			
.1				106/20/89		1	:		'			
·10				106/20/89					1		1 1	
. 2				106/20/89			1		1		, ,	
4 1				106/20/89			1		1		1 1	
	13676020			106/20/89			1		1		1 I	
4 1				106/20/89			l		1		1 I	
10				106/20/89			1		1		1 1	
3 SL W				106/20/89			l		1		1 I	
-3 WP3-1				106/20/89			l		1		+ 1	
-2				106/20/89			l		1		* I	
BLANK	\$0613981			106/19/89			I		1		↓ I	
BLANK	S06149B1	1 (c)	106/14/89	106/20/89	92		!		ŧ.		1 1	

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

⁽b) TPH - Terphenyl

⁽c) Blank data is supplied for each day of extraction.

		========											: =
1	1				SURR	OGATE	MATRIX SPIK	E DATA	IDUPLICATE M.	SPIKE D	01 1		ı
1	1	-	1		RECOV	/ERY (%)	I		I		ŧ		. 1
1 FIELD	COMPOUND/	DATE	DATE	DATE	I		I ACCURACY	ACCEPTANCE	PRECISION PE	RECISION	rŧ I		1
SAMPLE	SAMPLE	SAMPLED	EXTRACTED	IANALYZED	I	TARGET	(%RECOVERY)	RANGE	I (%RECOVERY)	6 REL.	FLAG	COMMENTS	1
POINT	I NUMBER	1	4	I	(b)	RANGE	1	(25)	I	DIFF.	+ 1		1
1	l	-	1				ı				1		٠1
ł	MS/MSD DATA (a)	106/13/89	106/16/89	06/21/89	I		1		I		1 1		1
ı	1	1	1	I	I		I		I		1 1		ı
ſ	Naphthalene	1	1	I	ı		l 80	22-133	l 80	0.0	1 1		1
1	Acenaphthylene	1	1	1	I		94	33-145	95	1.1	1 1		1
1	l Pyrene	1	1	I	I		l 83	52-115	77	7.5	1 1		1
1	i	1	1	I	I		1		1		1 1		I
1	SAMPLE NUMBERS	1	I	I	I		1		İ		1 4		ı
1	1	1	I	I	ı		1		ĺ		1		Ī
I MS	13701M21	106/13/89	106/16/89	106/21/89	89	33-147	1		İ		1 1		ı
I MSD	13701022	106/13/89	106/16/89	106/21/89	81		I		1		1 1		1
1	ı	1	1	1 :	i		1		l .		1 1		I
1 3E-1	13701001	106/13/89	106/16/89	106/21/89	86		1		I		1 1		1
1 3E-2	13701002	106/13/89	106/16/89	106/21/89	88		1		1		1 1		ı
1 3E-3	13701003	106/13/89	106/16/89	106/21/89	89		1		1		1 -		1
1 3E-4	13701004	106/13/89	106/16/89	106/21/89	76		I		I		1 (ı
1 3E-5	13701005	106/13/89	106/16/89	106/21/89	89		1		I		1 1		1
1 3E-8	13701006	106/13/89	06/16/89	06/21/89	88		1		1		1 1		I
3E-10	13701007	106/13/89	106/16/89	106/21/89	89		1		1		1 1		I
1 3E-9	13701008	106/13/89	106/16/89	106/21/89	82		1		1		1 1		1
1 3W-1	13701009	106/13/89	06/16/89	106/21/89	88		ı		I		1 1		1
1 3W-2	13701010	106/13/89	06/16/89	106/21/89	92		I		1		1 1		1
1 3W-3	13701011	106/13/89	106/16/89	106/21/89	89		1		1		1 1		I
1 3W-4	13701012	106/13/89	06/16/89	106/21/89	89		1		I		1 1		!
I. 7-1	13701013	106/13/89	06/16/89	106/21/89	78		1		i		1 1		I
1 7-3	13701014	106/13/89	06/16/89	106/21/89	91		1		i		1 1		J
1 7-4	13701015	106/13/89	06/16/89	106/21/89	88		1		į		1 1		i
1 7-6	13701016	106/13/89	106/16/89	106/21/89	90		1		í		i i		1
1 7-7	13701017	106/13/89	06/16/89	106/21/89	76		I		I		1 1		I
IFIELD BL	13701018	106/13/89	106/16/89	106/21/89	94		1		t		1 1		1
EQUIP.BL	13701019	106/13/89	106/16/89	106/21/89	96		I		1		i 1		ŧ
ITRAVEL B	13701020	106/13/89	106/16/89	106/21/89	97		1 .		I		1 1		1
IQC BLANK	W06169B1 .	(c)	106/16/89	06/21/89	91		t		1		1 1		ŧ
1	1	ı	1	I I	ı		1		l		! !		1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

⁽b) TPH - Terphenyl

⁽c) Blank data is supplied for each day of extraction.

Table 2.21 - PAH Compounds - EPA Method 8100

1								MATRIX SPIKE		IDUPLICATE M			
FIELD I	COMPOUND/	I DATE	I DATE	DATE	ı		ı	ACCURACY A	ACCEPTANCE	IPRECISION	PRECISION	11	
SAMPLE I	SAMPLE	I SAMPLED	LEXTRACTED	I ANALYZED	1	TARG	ET I	(%RECOVERY)	RANGE	l (%RECOVERY)	% REL.	IFLAG	COMMENTS
POINT I		1			(b)	RAN			,	1	DIFF.	1	
	MS/MSD DATA (a)						,			1		1	
ı		I	1	I	1		1			1		ŀ	
1	Naphtha l ene	1	Į.	I	I		1	67	22-133	1 62	8	1	
ı	Acenaphthylene	1	1	ı	i		ı	i 80	33-145	1 75	6	1	
1	Pyrene	I	I	i	ı		-	67	52-115	63	6	t	
ı		I	I	I	l		1	1		ı		1	
ı	SAMPLE NUMBERS	ı	1	I	1			l		1		1	;
i		I	I	1	I			ı		I		ŧ	ı
		1	1	ı	ı			I		I		I	ı
	13726M22	106/15/89	106/19/89	106/21/89	1 72	2 33-	147	I		1		ł	ı
	13726D23	106/15/89	106/19/89	106/21/89	66	ó		I		1		I	l
ı		1	I	ı	1			i		I		1	I
- GW-WP2	13726002	106/15/89	106/19/89	106/21/89	1 7	1		ı		1		4	I
-GW-WP3	13726003	106/15/89	106/19/89	106/21/89	1 59	9		I		l		i	I
I-CW-WP1	13726004	106/15/89	106/19/89	106/21/89	1 46	5		ı		1		I	ı
1-CW-WP1	13726005	106/15/89	106/19/89	106/21/89	1 84	4		1		1		1	l .
-CW-WP3	13726007	106/15/89	106/19/89	106/21/89	1 7:	3		I		1		1	l
I-GW-WP4	13726008	106/15/89	106/19/89	106/22/89	1 70	6		I		1		1	1
1-CW-WP5	13726009	106/15/89	106/19/89	106/22/89	1 3	1		į.		1		i L	LOW SURROGATE R
1-CW-WP6	13726010	106/15/89	106/19/89	106/22/89	1 81	0		I		1		1	t
3-GW-WP2	13726011	106/15/89	106/19/89	106/22/89	1 8	2		I		I		1	i
B-GW-WP3	13726012	106/15/89	106/19/89	106/22/89	5	7		I		1		i	I
8-GW-WP4	13726013	106/15/89	106/19/89	106/22/89	1 8	7		1		1		I	F
B-GW-WP1	13726014	106/15/89	106/19/89	106/22/89	1 8	3		1		1		1	ı
5-GW-WP3	13726015	106/15/89	106/19/89	106/22/89	1 7	6		1		1		1	I
FIELD BL	13726019	106/15/89	106/19/89	106/22/89	1 9	2		1		L		1	I
EQUIP.BL	13726020	106/15/89	106/19/89	106/22/89	8	9		1		1		1	I
TRAVEL B	13726021	106/15/89	106/19/89	106/22/89	1 8	3		ŀ		1		1	I
QC BLANK	W06199B1	l (c)	106/19/89	106/22/89	1 8	8		1		1		1	I
	I	1	1	I	1			1		I		1	1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

⁽b) TPH - Terphenyl

⁽c) Blank data is supplied for each day of extraction.

==										********					==========	===
1		I			- 1	SURF	ROGATE	1	MATRIX SP	IKE DATA	DUPLICA	TE M.	SPIKE DATA	1	I	1
۱-			-	ł	II	RECOV	/ERY (%) -								1
-1	FIELD	COMPOUND/	DATE	DATE	DATE I			1	ACCURACY	ACCEPTANCE	PRECIS	ION	PRECISION	I	I	1
1 :	SAMPLE	I SAMPLE	SAMPLED	EXTRACTE	IANALYZEDI	TCE	TARGET	1(%RECOVERY)	RANGE	(%RECOV	ERY)	% REL.	FLAG	COMMENTS	1
1	POINT	I NUMBER	1	ł	1 1	(b)	RANGE	1		(25)	l		DIFF.	I	t	-1
1-		l	-1		11			-1-						I	!	1
1		MS/MSD DATA (a)	105/26/89	l NA	106/01/891			1			ı			ı	t .	1
1		1	F	I	t i			1			ı			I	l .	-1
į		l Ethylene Dibromide	1	I	t i			1	120	(c)	120	ı	0	I	1	1
ŧ		Dibromochloropropane	F	I	l i			1	102	(c)	102	!	0	I	1	1
1		1	I	I	1 1			1						ı	L	ı
ŧ		!	1	I	1 1			1		1				ı	1	1
ŧ		SAMPLE NUMBERS	1	I	1 1			1		1			1	•	1	1
ŧ		(1	I	1 1			ı							1	1
1	R2CMS	13572M26	105/26/89	l NA	06/01/89	110	(c)	1		1			1	l	I	1
1 1	R2CMSD	13572D27	105/26/89	l NA	06/01/89	110		1		1			1		I	1
1		t	1	ı	1 1			1		1			!		1	1
1	R4C	13572004	105/26/89	I NA	106/01/891	92		I		1			1		i	1
1	R3C	13572008	105/26/89	NA NA	06/01/89	106		ı		ı			1		ł	1
1	R2C	13572014	105/26/89	I NA	06/01/89	101		1		1			1		I	1
1	R1C	13572018	105/26/89	I NA	06/01/89	108		1		1			1		l	1
1 3	SITE 4	13572020	105/26/89	! NA	06/01/89	99		1					1		ŧ	1
1	R5C	13572023	105/26/89	NA.	106/01/891	96		1		1			I		1	1
l R	INSEATE	13572024	105/26/89	I NA	106/01/891	110		1		1			ļ		I	ı
ΙT	RIPBLK	13572025	105/26/89	l NA	106/01/891	107		I		1			ļ		I	1
ΙQ	C_BLANK	W05319B1	1 (d)	05/31/89	105/31/891	96		1		1			ļ		I	ŧ
ŧ		1	1	ı	1			1					ļ		I	1

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

⁽b) (TCE) = 1,1,2,2-Tetrachloroethane

⁽c) QC ranges have not been established.

⁽d) Blank data is supplied for each day of extraction.

1	•						IMATRIX SPIK					
FIELD	COMPOUND/	DATE					ACCURACY			PRECISION		
SAMPLE	SAMPLE	ISAMPLED	EXTRACTE	IANALYZED	I FB TA	ARGET	(%RECOVERY)	RANGE	(%RECOVERY)	% REL.	IFLAGI	COMMENTS
POINT I	NUMBER	t .			l (b) F		1	(25)		DIFF.	i 1	
	MS/MSD DATA (a)	105/26/89	NA	106/07/89				•••••	l			
I		1	1	I	ł		l .		I			
1	1,2-Dibromoethane	I .			l		1 102	(c)	111	-8		
1		1	1	1	l I		1		ı 1			
1	SAMPLE NUMBERS	1	' 	1			I		I .		 I 1	
1		1	I	I	ı		1		I		1 1	
R2CMS I	13572M29	105/26/89	l NA	106/07/89	102	(c)	1		I		1 1	
R2CMSD I	13572D30	105/26/89	l NA	106/07/89	l 98		1		i		1 1	
I		1	ı	1	ſ		1		1		1 1	
R4C I	13572002	105/26/89	1	106/07/89	88		1		1		1 1	
R3C I	13572006	105/26/89		106/08/89			1					
R2C I	13572012	105/26/89		106/07/89					1		1 1	
R1C I	13572016	105/26/89		106/07/89			1		: i			
R5C F	13572022 80607981	105/26/89 I (d)		106/08/89			1		I		 I I	
QC_BLANK	0000/981	, (0)		100/0//09	, 39		1		,			

FOOTNOTES: (a) Matrix Spike/matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

- (b) (FB) = Fluorobenzene
- (c) QC ranges have not been established.
- (d) Blank data is supplied for each day of extraction.

			===				= = =		=:			==			==			====	====	===		==
1	1								ı	SURR	OGATE	ı	MATRIX SPIK	E DATA	۱D	UPLICATE M.	SPIKE	DATA	.I	1		ŀ
1	- 1		· ! - ·		1		ı		1 6	RECOV	ERY (%) 1			1 -				1	- 1 -		- }
I FIELD	1	COMPOUND/	į	DATE	1	DATE	1	DATE	1			1	ACCURACY	ACCEPTANCE	1	PRECISION	PRECI	SION	I	1		ì
1 SAMPLE	j	SAMPLE	15	AMPL ED)	EXTRACTE	IAN	MLYZED	H	TCE	TARGET	ł	(%RECOVERY)	RANGE	١(%RECOVERY)	% RE	Ļ.	IFLA	GI	COMMENTS	1
I POINT	1	NUMBER	1		1		i		ı	(b)	RANGE	į	ı	(2S)	į		DIF	F.	I	1		}
1	-1		- 1 -		1		I		1.		-	-			1 -				1	- 1 -		-)
1	ţ	MS/MSD DATA (a)	1		1		i		ı			1	ı		ţ				1	1		F
1	1		i		1		t		1			ł	I		ŧ				I	1		1
I	i	Ethylene Dibromide	ş	NA	1	NA	ı	NA	ı			ı	NA NA	(c)	į	NA	NA		1	1		ì
1	I D	ibromochloropropane	ŧ	NA	1	NA	ŧ	NA	ı			1	NA.	(c)	i	NA	NA		İ	1		ŀ
1	1		į		I		ŧ		ł			ı	ı		ŀ				I	1		1
1	1		ì		1		į		ı			1	ı		i				1	ı		1
1	1	SAMPLE NUMBERS	1		1		i		t			1	l		1				1	1		1
1	1		1		1		ŧ		ı			ı	I		I				I	1		I
I MS	1	NA	1	NA	Į	NA	1	NA	ı	NA	(c)	ı	I		I				I	ı		1
I MSD	1	NA	1	NA	ŀ	NA	1	NA.	ı	NA		1	I		1				1	1		1
1	1		1		1		ł		1			1			1				I	1		1
14-1	1	13675018	I Q	5/26/8	391	NA	106	/13/89	H	86		1	I		I				I	1		1
l 8 - 1	1	13675028	10	5/26/8	391	NA	106	/13/89	Н	85		1	I		I				ļ	1		i
ITRAVELB	LI	13675036	10	5/26/8	391	NA	106	/13/89	H	102		ı	I		I				I	1		I
IFIELFBL	(13675038	10	5/26/8	391	NA	106	6/13/89	H	96		ı	I		I				I	1		I
LEQUIPBL	()	13675039	10	5/26/8	391	NA	106	6/13/89	H	97		I	I		I				1	1		I
IQC_BLAN	(1	W06129B1	I	(d)	į	06/12/89	106	712/89	H	106		1	I		I				1	ŧ		1
1	1		1		ł		I		ı			1	l		l				1	1		I

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

- (b) (TCE) = 1.1.2.2-Tetrachloroethane
- (c) QC ranges have not been established.
- (d) Blank data is supplied for each day of extraction.

Table 2.25 - EDB Analysis - EPA Method 504

					=====									-=
1 1				1	SURR	OGATE	IMATRIX SPIK	E DATA	IDUPLICATE M.	SPIKE DAT	ΑI	I		ţ
		-1	1	(RECOV	ERY (%)	I		١		-	- +	·	- 1
I FIELD I	COMPOUND/	DATE	DATE	DATE I			I ACCURACY	ACCEPTANCE	PRECISION	PRECISION	1	ì		1
SAMPLE	SAMPLE	1 SAMPLED	IEXTRACTE	IANALYZEDI	FB	TARGET	I (%RECOVERY)	RANGE	(%RECOVERY)	% REL.	IFLA	G)	COMMENTS	i
I POINT I	NUMBER	1	I	1 1	(b)	RANGE	1	(25)	1	DIFF.	1	1		ļ
-		-1	1				I	<i>-</i>	1		-	-1		- 1
1 1	MS/MSD DATA (a)	105/26/89	l NA	06/21/89			1		1		1	1		1
t I		1	L	1 1			ı		I		1	1		1
1 1	1,2-Dibromoethane	1	L	1 1			1 113	NA	105	8	1	1		1
1 1		1	L	1 1			ı		l		1	1		1
1 1		1	L	1 1			1		I		1	1		1
1 1	SAMPLE NUMBERS	1	Į.	1 1			1		l		1	1		1
1 1		ı	1	I I			I		I		1	l		t
1 8-9MS 1	.13676#19	105/26/89	I NA	106/21/89	NA	NA	1		I		1	1		t
i 8-9MSD	13676D19	105/26/89	i NA	106/21/89	NA		I		ſ		1	ŀ		ŧ
1 1,		1	1	1 (I		1		1	1		ŧ
14-1-SL-W	13676009	105/26/89	i NA	106/21/89	88		I		į.		1	ι		i
14-10 I	13676010	105/26/89	l NA	106/21/89	90		I		§		1	1		1
11-3 I	13676017	105/26/89	l NA	106/21/89	88		I		1		1	1		1
18-9	13676019	105/26/89	l NA	106/21/891	86		1		1		j	1		1
IVBLKS I	Y06219B1	l (d)	l NA	106/21/89	94		t		I			1		1
1 1		1	I	1)			1		I		I	1		1
		========	=======			======						====		==

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

⁽b) (FB) = Fluorobenzene

⁽c) QC ranges have not been established.

⁽d) Blank data is supplied for each day of extraction.

Table 2.26 - EDB Analysis - EPA Method 504

		*************								========		************
1	1			1	SURR	OGATE	IMATRIX SPIK	E DATA	IDUPLICATE M.	SPIKE DATA	¥1	1
1	-			-	RECOV	'ERY (%)	1		1		-	t
I FIELD	I COMPOU	ND/ I DATE	I DATE	I DATE i			ACCURACY	ACCEPTANCE	I PRECISION	PRECISION	1	1
SAMPLE	I SAMPL	E ISAMPLE	D EXTRACT	E I ANAL YZEDI	TCE	TARGET	I (%RECOVERY)	RANGE	I (%RECOVERY)	% REL.	IFLAG	COMMENTS
I POINT	I NUMBE	R I	1	1 1	(b)	RANGE	I	(25)	I	DIFF.	1	l I
1	-		1	-							. 1	;
1	I MS/MSD DA	TA (a) 106/15/	891 NA	106/20/89			I		1		1	ŧ I
1	1	I	1	1 8			1		I		1	1
1	Ethylene Di	bromide	1	1 1			98	(c)	100	2.0	1	1
t	Dibromochlor	opropane	1	F 1			108	(c)	100	7.7	1	I I
1	ŧ	1	1 .	1			I		1		1	i I
ļ	1	T.	1	i i			I		I		1	1
1	1 SAMPLE NU	MBERS	1	F I			I		I		1	i i
1	1	ı	1	ļ I			I		I		1	1
I MS	1 1,3726M	22 06/15/	891 NA	106/20/891	107	(c)	I.		1		1	l i
I MSD	1 13726D	23 106/15/	891 NA	106/20/891	100		I				i	l i
1	1	1	1	I I			1		1		1	l i
1 3E-6	1 137260	01 06/15/	891 NA	106/20/891	102		L		I		1	1
1 1-2	137260	06 06/15/	891 NA	106/20/89	104		L		ŧ		1	t :
IQC BLAN	KI W06199	B1 (d)	106/19/8	9 06/20/89	97		t		t		1	1
1	1	1	i	1 1			1		1		1	1

FOOTNOTES: (a) matrix Spike/matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

⁽b) (TCE) = 1,1,2,2-Tetrachloroethane

⁽c) QC ranges have not been established.

⁽d) Blank data is supplied for each day of extraction.

Table 2.27 - PCB Analysis - EPA Method 8080

							========						==
1					I SUF	RROGATE	MATRIX SPIK	E DATA	IDUPLICATE M.	SPIKE D	A 1		1
		.	-1	1	REC	OVERY (%)					-		- 1
FIELD	COMPOUND/	I DATE	1 DATE	DATE	I		I ACCURACY	ACCEPTANCE	PRECISION	PRECISIO	NI I		1
SAMPLE	SAMPLE	I SAMPLED	IEXTRACTED	IANALYZED	I 488	3 TARGET	(%RECOVERY)	RANGE	(%RECOVERY)	% REL.	FLAG	COMMENTS	1
POINT	NUMBER	1	1	1	l (b)) RANGE	I	(2S)	I	DIFF.	ŧ		t
1			. 1	1	.	• • • • • • • •	I				- 1 1	•••••	- 1
1	MS/MSD DATA (a)	105/26/89	106/02/89	106/09/89	I		I		I		4 1		1
1		1	1	t	I		I		I		1 1		ŀ
1	PCB 1260	1	1	l	1		91	NA	93	0	1 1		1
1		f	1	1	I		I		I		1 1		i
1		1	1	t	I		I		I		1 1		1
1	SAMPLE NUMBERS	1	1	l	1		I		I		1 1		1
1		t	1	l	I		l		I		1 1		1
I R1DMS	13572M29	105/26/89	106/02/89	106/09/89	1 105	5 (c)	I		1		1 1		1
I R1DMSD	13572030	105/26/89	106/02/89	106/09/89	1 10	5	I		I		1 1		1
1		1	1	t	I		I		I		1 1		1
l R1U	13572015	105/26/89	106/02/89	106/09/89	1 98	В	I		I		1 1		1
l R1C	13572016	105/26/89	106/02/89	106/09/89	1 98	8	I		I		1 1		1
RID	13572017	105/26/89	106/02/89	106/09/89	1 97	7	I		1		1 1		1
∤ PBLK02	W06029B1	(d)	106/02/89	106/08/89	l' 104	4	I		I		1 1		1
t		ř	1	I	I		I		l		1 1		1
													==

FOOTNOTES: (a) Matrix Spike/matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

- (b) (4BB) = 4-Bromobiphenyl
- (c) QC limits are not established.
- (d) Blank data is supplied for each day of extraction.

Table 2.28 - PCB Analysis - EPA Method 8080

	=======================================			
1 1		I SURROGATE IMATRIX SPIK	E DATA IDUPLICATE M. S	SPIKE DAT
	-	RECOVERY (%)		
I FIELD I COMPOUND/	1 DATE DATE ! DATE	1 ACCURACY	ACCEPTANCE PRECISION PR	ECISIONI I I
I SAMPLE I SAMPLE	SAMPLED TEXTRACTEDIANALYZ	D 1 4BB TARGET 1 (%RECOVERY)	RANGE (%RECOVERY) 9	REL. IFLAGI COMMENTS I
I POINT I NUMBER	1 1	1 (b) RANGE I	(2S)	DIFF.
	-111	1		
I MS/MSD DATA (a)	I NA I NA I NA	1 1	1	1 1
1 1	1 1	1 1	1	1 1 1
PCB 1260	1 1	l l NA	NA I NA	NA E I I
1 1	T F 1	1 1	1	1 1
I I	1 1	1 1	I	1 1
I SAMPLE NUMBERS	1 1	1 1	I	1 1
1 1	1 1	1 1	I	1 1
I MS I NA	I NA I NA I NA	I NA (C) I	1	1 1
I MSD I NA	I NA 1 NA I NA	1 NA I	I	i i
1 (1 1	1	1	F I
3E-6 1.5 13676001	106/07/89 106/13/89 106/16/8	39 88	I	1 1
3E-6 3.5 13676002	106/07/89 106/13/89 106/16/8	39 81	1	1 1
5-3 SL W 13676023	106/07/89 106/13/89 106/16/3	39 84	1	į I
5-3 WP3- 13676024	106/07/89 106/13/89 106/16/8	39 89	I	1 1
15-2 13676025	106/07/89 106/13/89 106/16/8	39 94	1	1 1
IPBLK13 S06139B1	(d) 06/13/89 06/15/8	39 99	I	i I
1	T I	1	1	1 1
1111111111111111		. 2 . 2 . 2 . 2 . 2 . 2 . 2 . 2 . 2 . 2	************	*******************************

FOOTNOTES: (a) Matrix Spike/Matrix Spike Duplicates (MS/MSD) samples are run every 20 samples regardless of analysis date.

- (b) (4BB) = 4-Bromobiphenyl
- (c) QC limits are not established.
- (d) Blank data is supplied for each day of extraction.

Table 3.1 - Total Organic Carbon - EPA Method 415

1 1		MATRIX SPIKE DATA	DUPLICATE M. SPIKE DATAL	1
(-	l	-1
FIELD COMPOUND/	I DATE I DATE I DATE	I ACCURACY ACCEPTANCE	1 PRECISION PRECISION	1
SAMPLE SAMPLE	SAMPLED EXTRACTEDIANALYZED	(%RECOVERY) RANGE	I (%RECOVERY) % REL. IFLAC	GI COMMENTS I
POINT I NUMBER	1 1	(25)	DIFF. I	T t
i		-		-11
i MS/MSD DATA (a)	I NA I NA I NA	T	I I	1 1
1	1 1	1	I I	1
1 Total Organic Carbon	n I I	93 80-120	I 95 0.7 I	1
1	+ + 1	1	I I	1
I SAMPLE NUMBERS	1 1	1	1	1 1
1	1 1	1	1	1
l 4-1 67417	06/07/89 NA 06/26/89	1	1	1
l 8-1 l 67421	06/07/89 NA 06/26/89	1	i i	1 1
TRAVEL BLK! 67430	106/07/89 NA 106/26/89	1	I I	1 1
IFIELD BLK 67431	106/07/89 NA 106/26/89	1	· 1	1
IEQUIP. BLKI 67432	06/07/89 NA 106/26/89	1	I I	1
IMETHOD BLK! NA	(b) NA 106/26/89	T	I I	. 1
1	1 1	1	I I	1 I
=======================================			=======================================	

FOOTNOTES: (a) MS/MSD was not performed on a sample collected from JANG.

⁽b) Blank data is supplied for each day of extraction.

Table 3.2 - Total Organic Carbon - EPA Method 415

1	I					MATRIX SPIKE C	DATA	DUPLICATE M. SF	PIKE DATA	1 (
			- ,	- 1	.	ł					
I FIE	LD I	COMPOUND/	DATE	I DATE	DATE	ACCURACY AC	CEPTANCE	PRECISION PR	RECISION	1	
I SAM	APLE I	SAMPLE	SAMPLED	EXTRACTED	IANALYZED	i (%RECOVERY)	RANGE	(%RECOVERY)	6 REL.	FLAGI	COMMENTS
l POI	NT I	NUMBER	1	t	I	1	(25)	l	DIFF.	l f	
I	1		.	- 1	.	1					
I	1	MS/MSD DATA (a)	l NA	I NA	I NA	1	ı	I		1 1	
I	1		1	1	1	1	1	l		1 1	
I	1	Total Organic Carbon	1	1	I	1 101	80-120	112.2	7.19	1 1	
1	1		1	1	ţ	+	1	ı		l F	
i .	- 1	SAMPLE NUMBERS	1	ı	1	1	!	I		i	
1	- 1		1	1	i	1	1	1		1	
1 4	l-1	67297	106/07/89	i NA	106/26/89	1	1	l .			
l 4-	10	67298	106/07/89	I NA	106/26/89	1	!	ı		1	
1 1	- 3 I	67305	106/07/89	l NA	106/26/89	1		ı		1 1	
1 8	3-1 I	67307	106/07/89	l NA	106/26/89	1		ı		1 1	
1 ME THO	D BLK	NA	(b)	l NA	106/26/89	1	:	i .		1 }	
l	1		1	1	1	1	:	1			

FOOTNOTES: (a) MS/MSD was not performed on a sample collected from JANG.

⁽b) Blank data is supplied for each day of extraction.

Table 3.3 - Total Organic Carbon - EPA Method 415

==:		2 =			===	=======		z :		********	= :			===		
1		ı						1	MATRIX SPIK	E DATA	10	OUPLICATE M.	SPIKE DATA	ŀ	- 1	• 1
1		- 1		ł	-1-			- 1			١.			1	1	
1	FIELD	ł	COMPOUND/	DATE	ŧ	DATE	I DATE		ACCURACY	ACCEPTANCE	1	PRECISION	PRECISION	I	- 1	1
1	SAMPLE	į	SAMPLE	SAMPLED	1 €	XTRACTED	IANALYZED)	(%RECOVERY)	RANGE	П	(%RECOVERY)	% REL.	IFL	٨G١	COMMENTS
1	POINT	1	NUMBER	I	1		I		1	(25)	I		DIFF.	I	ł	1
1 -	-	- 1		.	- -			-			٠ [-			1	1	
1		1	MS/MSD DATA (a)	I NA	1	NA	l NA		I		I			I	- 1	1
1		ı		L	1		1		I		t			1	- 1	1
1		1	Total Organic Carbon	1	ı		1		93	80-120	1	95	0.7	ł	- 1	1
1		ı		ŧ	1		1		1		1			1	- 1	i
1		1	SAMPLE NUMBERS	1	1		1		l		1			1	1	1
ı		ı		1	1		1		1		1			1	1	I
1	3-6	1	67618	106/15/89	1	NA	106/28/89)	I		I			I	1	I
1	1-2	1	67623	106/15/89	1	NA	106/28/89	9	I		I			1	- 1	1
IM	ETHOD BL	.K I	NA	(b)	1	NA	106/28/89	,	t		ı			I	- 1	1
1		1		1	1		1		I		1			1	- 1	ı

FOOTNOTES: (a) MS/MSD was not performed on a sample collected from JANG.

⁽b) Blank data is supplied for each day of extraction.

Table 3.4 - Total Suspended Solids - EPA method 160

***************************************	*************			
1		IMATRIX SPIKE DATA	IDUPLICATE M. SPIKE	DAI 1
1	-			
FIELD COMPOUND/	I DATE I DATE	I ACCURACY ACCEPTANC	E PRECISION PRECIS	IONI I I
SAMPLE SAMPLE	SAMPLED ANALYZE	D I (%RECOVERY) RANGE	I (%RECOVERY) % REL	. IFLAGI COMMENTS I
I POINT I NUMBER	1	(25)	I DIFF	. 1 1 1
1	-			
MS/MSD DATA (a)	I NA I NA	1	1	1 1
t I	1	1	ı	1 1
1 Total Suspended Solids	1	i NA NA	I NA NA	1 1
1	1 1	1	1	1 1
I SAMPLE NUMBERS	1 +	I	1	1 1
1	1 (I	1	1 1
I 3E-6 ! 13726001	106/15/89 106/17/8	9	1	1 1
METHOD BLK! NA	l (a) 106/17/8	9	1	1 1
I i	1	1	1	1 1
*************************				. * * * * * * * * * * * * * * * * * * *

FOOTNOTES: (a) Blank data is supplied for each day of extraction.

Table 3.5 - Total Suspended Solids - EPA Method 160

= :	=======				==		***********		========	========				Ξ
ŧ		1					IMATRIX SPIK	E DATA	IDUPLICATE M	. SPIKE D	A I	1		1
1.		- j ·			- 1 -		.		1		-	- -		1
1	FIELD	1	COMPOUND/	DATE	ı	DATE	ACCURACY	ACCEPTANCE	I PRECISION	PRECISION	NI	ŧ		l
1	SAMPLE	1	SAMPLE	1 SAMPLED	LA	NALYZED	I (%RECOVERY)	RANGE	(%RECOVERY)	% REL.	IFLAG	GI	COMMENTS	I
1	POINT	ı	NUMBER	1	1		1	(28)	I	DIFF.	ı	1		I
1.				1	- 1 -		.				- 1	- 1 -		ţ
-1		1	MS/MSD DATA (a)	l NA	ı	NA	1		1		1	1		ŧ
1		1		I	ŧ		1		ŀ		1	I		1
1		1	Total Suspended Solids	I	1		I NA	NA	I NA	NA	1	ı		ı
1		1		I	ī		t		1		t	i		ı
i		ı	SAMPLE NUMBERS	I	ī		1		1		ı	1		I
1		1		1	1		1		1		1	1		ŧ
1	3-3	1	13675011	106/09/89	1	NA	I		1		1	1		l
1	4-2	1	13675019	106/09/89	1	NA	I		I		1	1		į
1	1-6	1	13675027	106/09/89	i	NA.	1		i		1	1		ı
1	8-3	ı	13675030	106/09/89	1	NA	1		1		1	t		ı
17	METHOD BI	LKI	NA .	(a)	4	NA	t		I		1	ł		ı
ı		1		1	1		i		1		1	1		ı
=	=======												=======================================	=

FOOTNOTES: (a) Blank data is supplied for each day of extraction.

Table 4.1 - Metals Analysis - EPA Methods 7000, 7470, 6000

	_			IKNOWN REFERENCE SAMPLES	ENCE SAMP	LES		IMATRIX SPIKI	(MATRIX SPIKE (ACCURACY) DUPLICATE (PRECISION)	IDUPLICATE	PRECISION)			
	-	I DATE	I DATE							-	-			
	_		SAMPLED ANALYZED OBSERVED	OBSERVED	TRUE	æ	CONTROL	CONTROL ! PERCENT	ACCEPTABLE I	ā	CONTROL	PREP	-	
METAL	I METHOD	i METAL I METHOD i		VALUE	VALUE	RECOVERY	Limits	RECOVERY	RANGE	RPD	LIMITS	BLANK IFLAG	FLAG	COMMENTS
ARSENIC	· —	1 05/26/89 1 06/09/89	68/60/90	35.24	37.6	93.7	80-120	83.5	75-125	0	20	-0.76	<u>-</u> -	
BARIUM	<u> </u>	05/26/89	05/26/89 06/09/89 2013.33	2013.33	2010	100.2	80-120	6.001	75-125	15.6	20	3.439	<u>-</u> -	
CADMIUM	<u>a.</u>	05/26/89 06/09/89	68/60/90	524.12	492	106.5	80-120	113.4	75-125	-	20		<u>.</u>	1
CHROWLUM	<u> </u>	05/26/89 06/09/89	68/60/90	520.89	503	103.6	80-120	118.7	75-125	0	20	6.28	 !	
LEAD		05/26/89 06/09/89	06/06/89	37 . 16	39.2	94.8	80-120	89.5	75-125	- 1.9	20			
MERCURY	- C	05/26/89 06/12/89	06/12/89	3.58	7	8. 4.	80-120	105.0	75-125	0	20		<u>-</u>	
SELENIUM	<u>.</u>	05/26/89 06/09/89	1 68/60/90 1	6.69	41.6	168.0	80-120	81.0	75-125	0	20	-0.87	 : :	
SILVER	<u> </u>	05/26/89 06/09/8	1 68/60/90 1	≨	₹	₹		98.6	75-125	0	20	-	-	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Table 4.2 - Metals Analysis - EPA Methods 7000, 7470, 6000

OWN RE	₩N RE	IKNOWN REFERENCE SAMPLES	MPLES		IMATRIX SPIKE (ACCURACY) IDUPLICATE (PRECISION)	(ACCURACY)	DUPLICATE	(PRECISION)		
DATE DATE SAMPLED ANALYZED OBSERVED TRUE %	TRUE			CONTROL	PERCENT	ACCEPTABLE	PERCENT	CONTROL	PREP	
VALUE VALUE RECOVERY	VALUE		VER	Y LIMITS	RECOVERY	RANGE	RPD	LIMITS	BLANK IFLAG	AG COMMENTS
880.3 917		17	•	96 80-120	1 82.0	75-125	ر. 8.	35	-0.76	
5.4 4.8		60	112.3	3 80-120	9.76	75-125	0	35	3.439	
42 45.4		4	92.5	5 80-120	100.5	75-125	17.8	35		
98.3 99.6		بو	79.2	2 80-120	102.4	75-125	26.5	35	6.28	L I LOW LCS RECOVERY
197.4 236		36	83.6	6 80-120	1 56.0	75-125	. 0.7	35	·	L LOW SPIKE RECOVERY
10.8 12.7		7	6 0	85 80-120	7.76	75-125	0	35		
30.4 39.2		7	77.6	6 80-120	100.0	75-125	0	35	-0.87	L LOW LCS RECOVERY
ž	• • • • • •		≨	2	92.6	75-125	0	35	-	_

Table 4.3 - Metals Analysis - EPA Methods 7000, 7470, 6000

	PREP	BLANK IFLAG I COMMENTS		2.31			0.77			
IMATRIX SPIKE (ACCURACY) IDUPLICATE (PRECISION)!	NT CONTROL	LIMITS	0 20	.7 20	1/0 20	2 20	7.2 20	0 20	0 20	,0 20
(Y) IDUPLICA	I ILE I PERCENT	I RPD	_	7.7/81	0/6.91	1 0/2.2	3.4/17.2	-	-	0/0
KE (ACCURAC	ACCEPTABLE	RANGE	5 75-125	75-125	75-125	75-125	75-125	85 75-125	96 75-125	75-125
IMATRIX SPI	I PERCENT	I RECOVERY	5.99	102/104	103/98.6	105/104	1 86.5/95	-	-	1 96/90.2
	CONTROL	/ LIMITS	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120
WPLES	æ	RECOVERY	5 105.3	4 109.4	2 112.4	3 110.8	2 105.7	011	2 92.4	4 110.3
IKNOWN REFERENCE SAMPLES	D TRUE	VALUE	8 37.6	2 2010	3 492	9 503	3 39.2	6.4	5 83.2	2 484
IKNOWN RE	I OBSERVE	I VALUE	39.58	1 2199.2	1 553.23	1 557.39	41.43	5.39	76.85	1 533.72
-	DATE I DATE I SAMPLED I ANALYZED I OBSERVED		1 06/15/89	1 06/15/89	06/15/89	06/09/89 06/15/89	1 06/15/89	1 06/21/89	1 06/15/89	1 06/12/89 1
-	DATE I DA I SAMPLED I ANAL		1/90 68/60/90	1 06/09/89 1 06/1	1/90 68/60/90	68/60/90	06/09/89 06/15/89	06/09/89 06/21/89	1/90 68/60/90	1/90 68/60/90
-	<u>:</u> <u>:</u> 	METAL METHOD	<u>-</u> -	d	d -	d -		S	_	<u>-</u>
	! ! ! !	METAL	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER

Table 4.4 - Metals Analysis - EPA Methods 7000, 7470, 6000

-				IKNOWN REFERENCE SAMPLES	ENCE SAMP	LES	_ •	IMATRIX SPIKE	E (ACCURACY)	IDUPLI.	HAATRIX SPIKE (ACCURACY) IDUPLICATE (PRECISION)	<u> </u>			
-		DATE I DAT	DATE			! ! ! ! ! !	-		• • • • • • • • • • • • • • • • • • •	<u> </u>	• • • • • • • • • • • • • • • • • • •	-			
METAL	I I METHOD	SAMPLED	ZED 1	OBSERVED	TRUE	% RECOVERY	CONTROL	I PERCENT I RECOVERY	ACCEPTABLE RANGE		PERCENT CONTROL RPD LIMITS		PREP I BLANK IFLAG		COMMENTS
ARSENIC		1 06/09/89 1 06/15	06/15/89	9 . 707	917	77.2	80-120	83.2	75-125		0/98.2	35 -	2.9 L	 	LOW LCS RECOVERY
BARIUM	<u>a</u>	1 06/09/89 06/15	06/15/89	4.7	4	6 · 26	80-120	9.06	75-125	/0 -	0/11.7	35 1	4.43		
CADMIUM	d.	06/09/89 06/15	06/15/89	38.1	45.4	83.9	80-120	8.16	75-125	_	0/0	35 -	<u>-</u>		
CHROMIUM I	<u>a</u>	1 06/09/89 06/15/89	1 06/15/89 1	91.2	9.66	91.6	80-120	1 93.0	75-125	/0 -	0/16.3	35 -	4.023		
LEAD	·	68/60/90	1 06/09/89 06/15/89 222/196	i	236/236	236/236 94.2/83.4	80-120	80-120 136/120	75-125	1 0/3.2/17	27.17	35	0.77	<u> </u>	0.77 K HIGH SPIKE RECOVERY
MERCURY	S	68/60/90	06/09/89 06/25/89	12.4	12.7	97.6	80-120	80-120 108/109	75-125	_	0/0	35 t			
SEL ENIUM I	u_	1 06/09/89 1 06/15/89	06/15/89	24.6	39.2	62.8	80-120	0.08	75-125	_	0/0	35			LOW LCS RECOVERY
SILVER	d	1 06/09/89	1 06/09/89 06/15/89	18.4	22.2	82.9	(a)	1 90 1	75-125	_	0/0	35 -	-	-	

(a) No control limits have been established.

Table 4.5 - Metals Analysis - EPA Methods 7000, 7470, 6000

	Countries				-4 I M IDUP. PRECISION NOT MET		L I LOW SPIKE RECOVERY	M. IDUP. PRECISION NOT MET	· · · · · · · · · · · · · · · · · · ·
-	PREP		·		1 1 1 1 1				-
PRECISION)	CONTROL	20 20	20	20	20	20	20	20	20
DUPLICATE (PERCENT		8.1	0	59.2	16.2	0	30.3	0
MATRIX SPIKE (ACCURACY) IDUPLICATE (PRECISION)	ACCEPTABLE	75-125	75-125	75-125	75-125	75-125	75-125	75-125	75-125
ATRIX SPIKE	PERCENT	4.96	94.9	86	87.5	80-120 INOT REPORTED	72.7	93.5	06
3	CONTROL	80-120	80-120	80-120	80-120	80-120 IN	80-120	80-120	80-120
LES	* Say	93.9	92.6	93.7	92.8	98.6	110	96.2	66
RENCE SAMP	TRUE	37.6	2010	492	503	39.2	6. ₹	41.6	484
IKNOWN REFERENCE SAMPLES	OBSERVED	35.3	1922.3	461	467	38.66	5.39	40.04	479
_	DATE ANALYZED	06/22/89	06/22/89	06/22/89	06/22/89	06/22/89	06/20/89	06/22/89	06/22/89
	DATE DATE SAMPLED ANALYZED OBSERVED	06/15/89 06/22/89	1 06/15/89 06/22/89	06/15/89 06/22/89	06/15/89 06/22/89	06/15/89 06/22/89	06/15/89 06/20/89	1 06/15/89 06/22/89	06/15/89 06/22/89
	OGE ST	!	d -	۵.	٩	_	દ	_	a .
	171	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENTUM	SILVER

APPENDIX F

Data Validation Technical Memoranda for the Second Step of the Site Investigation

FOREWORD

Data for the second step of the site investigation were validated by CH2M HILL staff members (Chris Ohland and Ann Castleberry) who are not employed by CH2M HILL Environmental Laboratories, Inc. The following technical memoranda describe site investigation data, their quality, and their usability. Data validation for data obtained during the second step of the site investigation through December 1989 is described in the memorandum dated February 2, 1990. Data validation for additional samples obtained during November 1990 at Site 6 is described in the memorandum dated December 3, 1990. The term remedial investigation (RI) is used incorrectly in the first memorandum and should be read as site investigation (SI).

TO:

Ann Castleberry/MGM

FROM:

Chris Ohland/GLO

DATE:

February 2, 1990

SUBJECT:

Data Validation for Jacksonville ANG Remedial Investigation

PROJECT: GNV27267.JX.RI

1.0 INTRODUCTION

This memorandum presents the data validation discussion and summary tables for the Jacksonville Air National Guard remedial investigation (RI) laboratory data. Data validation is the technical review of a data package using criteria established in the data quality objectives of the Quality Assurance Project Plan.

During the RI, 16 soil and 35 water samples were collected and analyzed for various organic and inorganic parameters. The analyses are:

- Semivolatiles by gas chromatography/mass spectrophotometer (GC/MS);
- Volatile halocarbons by gas chromatography (GC);
- Volatile aromatics by GC;
- Polynuclear aromatic hydrocarbons (PAH) by GC;
- Total hardness;
- Total suspended solids (TSS); and
- Metals.

Participating laboratories were required to submit the Hazardous Materials Remedial Action Program (HAZWRAP) Level C QC data packages for data generated for the Jacksonville Air National Guard RI. Table 1.1 summarizes the Level C data package deliverables.

Data were reviewed and validated using HAZWRAP Level C Data Validation Guidelines [1]. For hardness and TSS methods a procedure that outlines samples holding times, initial calibration, continuing calibration, matrix spike, blank spike, and blank versus sample results was reviewed. In addition, the EPA Laboratory Data Validation Functional Guidelines [2,3] were used to

Table 1.1 (Page 1 of 2) SUMMARY OF LEVEL C DATA PACKAGE DELIVERABLES

GC/MS ORGANIC ANALYSES

CLP Form No.	<u>Purpose</u>
I	Data Summary
II	Surrogate Recovery
III	MS/MSD
IV	Method Blank
V	GC/MS Tuning
VI	Initial Calibration Data
VII	Continuing Calibration
VIII	Internal Standard Area
X	Holding Times
**	Laboratory Control Charts for Blank Spikes
**	Sample Raw Data Package

GC ORGANIC ANALYSES

CLP Form No.	<u>Purpose</u>
II I	Data Summary Surrogate Recovery
III	MS/MSD
IV	Method Blank
VI	Initial Calibration Data
VII	Continuing Calibration
VIII	Internal Standard Area
IX	Pesticide/PCB Calibration Data
X	Holding Times
**	Initial Calibration Data with Response
	Factors and Their Percent Difference
	from the Initial Calibration
**	Chromatograms of Second-Column
**	Confirmation Work
**	Laboratory Control Charts for Blank Spikes
* *	Sample Raw Data Package

Table 1.1 (Page 2 of 2)

INORGANICS

CLP Form No.

I
II
III
IV
V, Part 1
V, Part 2
VI
VIII
X
**

<u>Purpose</u>

Data Summary
Initial and Continuing Calibration
Blanks (10% Frequency)
ICP Interference Check
Spike Results
Postdigestion Spike Recovery (ICP only)
Duplicate (1 in 20)
Standard Addition Results
Holding Times
Laboratory Control Charts for Blank Spikes
Sample Raw Data Package

GLT949/028.50

Page 2 February 2, 1990 GNV27267.JX.RI

supplement HAZWRAP guidelines when no acceptance ranges or control limits are established.

When samples were received by the laboratory, they were assigned unique laboratory numerical identifiers. The sample numbering system ensures that the sample identity is unknown to the analyst. Table 1.2 correlates field sample point to laboratory number for ease in locating specific field site. Samples were analyzed in CH2M HILL laboratories in Montgomery, Alabama, and Gainesville, Florida.

For ease of discussion, the results of the validation process are discussed in the following order: organic analyses, wet laboratory analyses, and inorganic analyses.

2.0 ORGANIC ANALYSES

2.1 INTRODUCTION

The organic analyses data were reviewed and validated using HAZWRAP Level C Data Validation Guidelines and supplemented using the guidance document "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses" [2]. The required data deliverables as specified under Level C are laboratory control charts and forms analogous to those required in the CLP Statement of Work (SOW) [4]. The validation guidance list criteria for evaluating the complete data package form by form. A quick review of the forms is useful for understanding the validation process. The forms summarize and present the raw, experimental data.

Form I--Data Sheet presents the sample results and the information necessary for calculating holding times and is reviewed for completeness. Holding time is defined as the time, in days, from the collection of the sample to the extraction or analysis. It is important to note that the holding time for extraction is often different for water and soils for the same analytical method. Table 2.1 presents the EPA recommended holding times.

Form II--Surrogate Recovery summarizes the surrogate spike recovery data. Surrogate compounds are the structural homologs of target list compounds, often with deuterium substituted for hydrogen, and are therefore expected to behave in a similar manner during the analysis. Spike recoveries demonstrate laboratory performance and are evaluated using acceptance ranges delineated in the CLP SOW. Spike recoveries can also be used to estimate accuracy, which is a measure of the agreement between an experimental determination and the true value of the parameter being measured.

TABLE 1.2; SAMPLE CROSS REFERENCE

	Date		Sample	LMG Sample	Numbers
Matrix	Sample Collected	Sample Description	Number	Organic	Inorganic
SOIL		8-SL-MW3-1 (1-3')	73761	Organio	14969011
SOIL		8-SL-MW3-2 (3-5')	73762		14969012
SOIL		8-SL-MW2-1 (1-3')	73763		14969013
SOIL		· ·	73764		14969014
		8-SL-MW2-2 (3-5') 8-SL-MW1-1 (1-3')	73765		14969015
SOIL SOIL		, ,	73766		14969016
		8-SL-MW4-1 (1-3')	73767		14969017
SOIL SOIL		8-SL-MW1-2 (3-5')	73768		14969018
SOIL		8-SL-SB5-1 (1-3')	73769		14969019
		8-SL-SB5-2 (3-5') BK-SL-1 (1-2')	73770	14959001	14969020
SOIL		BK-SD-1	73771	14959002	14969021
SOIL			73772	14959002	14969022
SOIL		DG1-SD-1	73773	14959004	14969023
SOIL		DG2-SD-1	73/73	14333004	14969001
WATER		6-GW-MW1			14969001
WATER		6-GW-MW2	73860	14064001	14969002
WATER		7-GW-WP5A	73861	14964001	
WATER		7-GW-WP2A	73862	14964002	14969004
WATER		3W-GW-WP5A	73863	14964003 14964004	14969005 14969006
WATER		DG1-SW	73864	14964004	14969007
WATER		DG2-SW	73865 73866	14964005	14909007
WATER		2-GW-WP13		14064006	14969008
WATER		POTABLE DECON WATER	73867	14964006	14969006
WATER		2-GW-WP12	73868 73869	14964007	14969009
WATER	12/01/89		73870	14964007	14969010
WATER		FIELD BLANK	73871	14904008	14909010
WATER		TRIP BLANK	73952		14996001
WATER		3E-GW-MW1	73952		14996002
WATER		2-GW-WP13	73933		14996008
WATER		2-GW-WP13 (FILTERED)	73954		14996003
WATER		2-GW-WP12	73954		14996009
WATER		2-GW-WP12 (FILTERED)	73955		14996005
WATER		1-GW-MW1	73956		14996006
WATER		1-GW-MW2	73957	14988006	14996007
WATER		POTABLE DECON WATER C.E.4	73959	14300000	14000007
WATER		3E-GW-MW3	73960		
WATER		3E-GW-MW2	73961		
WATER		5-GW-MWB	73962		
WATER		5-GW-MWC	73963		
WATER		5-GW-MWA	73964		
WATER		BAILER BLANK #2	73965		14996004
WATER		TRAVEL BLANK	73966		1400004
WATER		5-GW-MW1	73967		
WATER		5-GW-MW2	73968	14988001	
WATER		8-GW-MW3	73969	14988001	
WATER		8-GW-MW2	73909	14988002	
WATER		8-GW-MW1	73970	14988004	
WATER		8-GW-MW4	73971	14988005	
WATER	12/05/89	BAILER BLANK #3	10312	,-,000000	

Table 2.1 HOLDING TIME LIMITS

<u>Analysis</u>	Method	Extraction Water	n Criteria Soil	Analysis <u>Criteria</u>
PNAs	610/8100	7 days	14 days	40 days
Volatile Halocarbons	601/8010		 .	14 days
Volatile Aromatics	602/8020			14 days
Semivolatiles	625/8270	7 days	14 days	40 days
Metals by GFAA	7000			6 months
Mercury by GFAA	7470			28 days
Metals by ICP	6000			6 months
TSS	160.2			
Total Hardness	130.2			

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Form III--Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recovery presents the recoveries of the MS/MSD compounds. Matrix spike compounds are found on the method target compound list (TCL). The field sample is split and a portion is spiked with known quantities of TCL compounds in order to ascertain the effects of the specific sample matrix on the recovery of analytes. Acceptance ranges are delineated in the CLP SOW. MS/MSD spike recoveries can also be used to estimate accuracy and precision. Precision is a measure of the agreement or repeatability of a set of replicate results obtained from duplicate analyses made under the same conditions.

Form IV--Method Blank Summary sheets correlate method blanks to samples. Method blanks are ASTM Type II (distilled, deionized) water that is treated as a sample in the laboratory. In other words, the method blank undergoes the same analytical process as the corresponding samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. Usual frequency is 1 in 10 or 20 (depending on the analytical method) or one per batch, whichever is more frequent.

Form V--GC/MS Tuning and Mass Calibration presents the tuning and mass calibration information for each GC/MS instrument used to produce data in the data package. The CLP SOW establishes tuning and performance criteria in order to ensure mass resolution, identification, and, to some degree, sensitivity. These criteria are not sample specific, and conformance is determined using standard materials; therefore, these criteria should be met in all circumstances. For volatiles analyses, Bromofluorobenzene (BFB) is used; for semivolatiles, Decafluorotriphenylphosphine (DFTPP). Tuning compounds for PCB, EDB, and PAH using GC/MS are not reported. Analysis for PCB, EDB, and PAH using a gas chromatograph do not require tuning.

Forms VI and VII--Initial and Continuing Calibration are used to report compound recoveries from calibration solutions. Initial calibration data demonstrate that the analytical instrument is performing satisfactorily and is capable of producing acceptable quantitative data at the beginning of the analytical period. Continuing calibration checks document that the instrument continues to produce acceptable data. Calibration data must fall within the specified acceptance criteria for analysis to begin or continue.

Form VIIIA--Internal Standards presents the internal standards peak area information. Internal standard compounds are used to provide information about analytical instrument sensitivity and response during every run. Acceptance criteria are established in the functional guidelines.

Additional areas for review include TCL compound identification, compound quantitation and reported detection limits, and tentatively identified compounds.

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2.2 ORGANIC DATA VALIDATION SUMMARY TABLES

Before the analytical results are released from the laboratory, both the sample and the quality control data must be reviewed carefully. Laboratory personnel review the raw data to verify sample identity, instrument calibration, detection limits, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the quality control samples are processed to demonstrate that the analytical results are within laboratory prescribed criteria for accuracy and precision. This memorandum includes only summary tables for the data validation process. The original data sheets and data summary tables appear elsewhere in the RI report.

The data validation tables in this section summarize the quality assurance/quality control (QA/QC) information for each laboratory sample batch by analyses. They are arranged by analyses and separated by sample delivery group.

The information presented in the summary tables includes MS/MSD percent recovery and precision, surrogate spike recovery, internal standards, holding time, and laboratory method blank analyses. The summary tables organize samples by the corresponding MS/MSD samples. Data that does not strictly meet the criteria are flagged with letter abbreviations that indicate a problem with the data. The flags are also included in the data summary tables so that the possible limitations of data quality will be considered before the data is used to support project decisions. Acceptable matrix spike recovery ranges are defined in the appropriate method or by control charts. Acceptable ranges for surrogate recoveries from the CLP SOW [4] were applied to semivolatiles. Acceptance ranges for surrogate recoveries from the control charts were applied to the remaining analyses. Table 2.2 summarizes the acceptable limits for each analysis and a source reference.

Lettered flags used in the text include:

- U Undetected. Analyte was analyzed for but not detected above the method detection limit.
- B Analyte was detected in the sample at a concentration less than five times the concentration (ten times for common contaminants) in the associated laboratory or field blank.
- J Estimated. Analyte was present but the reported value may not be accurate or precise. For example, the MS/MSD precision is outside the acceptable range and the data may be biased high or low.

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- K Analyte was present but the reported value may be biased high; the actual value is expected to be lower. For example, the surrogate spike recovery was above the acceptable limits.
- L Analyte was present but the reported value may be biased low; the actual value is expected to be higher. For example, the holding time was exceeded or the surrogate spike recovery was below the acceptable limits.
- M Duplicate precision was not met. It is not possible to determine whether the resulting bias is high or low.

It is important to note that the Data Sheets (Form I) also contain flags and the usage is the same as listed above. Under the current CLP SOW, the laboratory is required to report any analyte concentration that is above the instrument detection limit but below the Contract Required Quantitation Limit (CRQL). These analyte concentrations are labeled with a "J" for data estimated.

The summary tables for a given analytical method are presented by laboratory number (in ascending sequential order). The data validation summary tables are discussed below.

2.2.1 Semivolatiles--EPA Method 8270

Table 2.3 summarizes the QA/QC data for four low concentration soil samples.

Initial calibration relative standard deviation (percent RSD) criteria were met for all target analyte compounds, except benzoic acid (31.2 percent). Continuing calibration percent difference (percent D) criteria (= <25 percent) were met for all target analyte compounds, except hexachlorobenzene (90.6 percent). Because the out-of-control target analytes were not detected in any of the samples, no qualification of the data was applied. All other QA/QC measures were met, and the data are acceptable.

2.2.2 Volatile Halocarbons and Volatile Aromatics--EPA Methods 601/602/8010/8020

Tables 2.4 through 2.6 summarize the QA/QC data for the purgeable halocarbons and aromatic analyses. The performing laboratory uses a modified EPA Method 601/602 for water samples and modified EPA Method 8010/8020 for soil samples. The laboratory modifies the methods by combining the halocarbon and aromatic analyses into a single analysis. This is accomplished by

Table 2.2 (Page 1 of 2) SUMMARY OF ACCEPTABLE RECOVERY RANGES FOR ORGANIC METHODS

VOLATILESEPA METHOD 8010	MS/MSD (% Recovery)		
Compound	Water	Soil	
Chloromethane	D-193	D-193	
Bromomethane	D-144	D-144	
Dichlorodifluoromethane	(c)	(c)	
Vinyl chloride	D-144	D-144	
Chloroethane	46-137	46-137	
Methylene chloride	25-162	25-162	
Trichlorofluoromethane	21-156	21-156	
1,1-Dichloroethene 1,1-Dichloroethane	28-167	28-167	
trans-1,2-Dichloroethene	47-132 38-155	47-132 38-155	
Chloroform	49-133	49-133	
1,2-Dichloroethane	51-147	51-147	
1,1,1-Trichloroethane	41-138	41-138	
Carbon Tetrachloride	43-143	43-143	
Bromodichloromethane	42-172	42-172	
1,2-Dichloropropane	44-156	44-156	
cis-1,3-Dichloropropene	22-178	22-178	
Trichloroethene	35-146	35-146	
Dibromochloromethane	24-191	24-191	
1,1,2-Trichloroethane	39-136	39-136	
trans-1,3-Dichloropropene	22-178	22-178	
Bromoform	13-159	13-159	
1,1,2,2-Tetrachloroethane	8-184	8-184	
Tetrachloroethene	26-162	26-162	
Chlorobenzene	38-150	38-150	
1,3-Dichlorobenzene 1,2-Dichlorobenzene	7-187 D-208	7-187 D-208	
1,4-Dichlorobenzene	42-143	42-143	
Bromochloromethane	42-143	42-143	
VOLATILES - EPA METHOD 8020	MS/MSD	(% Recovery)	
Compound	<u>Water</u>	Soil	
Tert Butyl Methyl Ether	(c)	(c)	
Benzene	39-150	39-150	
Toluene	46-148	46-148	
Ethylbenzene	32-160	32-160	
Xylene	(c)	(c)	
Chlorobenzene	55-135	55-135	
1,4-Dichlorobenzene	42-143	42-143	
1,3-Dichlorobenzene	50-141	50-141	
1,2-Dichlorobenzene	37-154	37-154	

Table 2.2 (Page 2 of 2)

	Surrogate (% Recove	ry)
Compound	Water	_Soil_
Trifluorotoluene	-	-
PAHsEPA Method 8100	MS/MSD (% Record	very)
Compound	Water	Soil
Naphthalene Acenaphthylene Pyrene	22-133 33-145 52-115	21-133 33-145 52-115
	Surrogate (% Recove	ery)
Compound	Water	<u>Soil</u>
Terphenyl	33-147	-
SEMIVOLATILESEPA METHOD 8270	MS/MSD (% Reco	very)
Compound	Water	_Soil_
1,2,4-Trichlorobenzene Acenapthene 2,4-Dinitrotoluene Pyrene N-Nitroso-Di-n-Propylamine 1,4-Dichlorobenzene Pentachlorophenol Phenol 2-Chlorophenol 4-Chloro-3-Methylphenol 4-Nitrophenol Nitrobenzene 2-Fluorobiphenyl p-Terphenyl Phenol	39-98 46-118 24-96 26-127 41-116 36-97 9-103 12-89 27-123 23-97 10-80 35-114 43-116 33-141 10-94	38-107 31-137 28-89 35-142 41-126 28-104 17-109 26-90 25-102 26-103 11-114 23-120 30-115 18-137 24-113
2-Fluorophenol 2,4,6-Tribromophenol	21-100 10-123	25-121 19-122

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TABLE 2.3; QA/QC DATA FOR THE SEMIVOLATILE ANALYSIS - EPA METHOD 8270

4 LOW CONC. SOILS 14959

MATRIX CASE NUMBER

		Ι									Γ							300	_									î
																				_	,,							TIC = HEXANEDIOIC ACID ESTER (8700 LIG/KG)
																			MENTS,	BLANK CONTAMINATION ,	SAMPLE SPECIFIC FLAGS							STER (8.
												0							GENERAL COMMENTS	DNTAMI	SPECIFI							ACID F
												NO FIELD DUPLICATES WERE COLLECTED							GENER/	LANKO	AMPLE:							
											NO	RE COL								80	S							HEYAP
		VTS:									PRECIS	TES WE									ပ		•	_	_	NA	NA	Ė
		OMME									ICATE	UPLICA							No. OF	CMPDs	TCL TIC	0	1 2	0	0	NAN	N AN	•
		GENERAL COMMENTS:									FIELD DUPLICATE PRECISION	IELD DI							QOH.	BLANK	O O	S12089B1	S12089B1	S12089B1	S12089B1	S12089B1	S12089B1	MA
		GEN				Γ					FIEL	Š							CONTAMIN. METHOD	_								
								<u>.</u>						9					NTAM	MTH FLD	ANT PHN CRY PRY (Y/N) (Y/N)	X Z	Y Z	X X	N A A	N A N	N N	N
								(31.2%						E (90.69					8	Σ	RY (Y	7.76			89.6	85.3 N	95.1 N	100
			ᆸ	턴			ᇤ	C ACID						ENZEN					e e		SRY P		92.9		95.4 8	86.4	101.1	1
			ERIA M	ERIA M			ERIA M	SENZO					IIA MET	OROBI					LANDA	ICE (%)	PHN (113.1 103.8	106.1		104.4	9.66	104.6 1	
			(12/14/89, 0908): ALL CRITERIA MET	(12/14/89, 1732): ALL CRITERIA MET			D) CRIT	CMPD E					CRITER	TARGET CMPD HEXACHLOROBENZENE (90.6%)					INTERNAL STANDARD	PERFORMANCE (%)	ANT	92.3			81.1	84.4	85.6	4 00
			908): AI	732): AI		(68/4	C (%RS	RGET ((0%) O	MPD HE					INTER	PERF	DCB NPT	95.3		89.8	91.2	82.1	88.3	0
			4/89, 0	14/89, 1		N: (12/1	ND CC	FOR TA			RATION	(6)	ND CC	GETCI								96.2		89.8	87.9	9.98	87.3	900
	200	ij				SPATIO	RRF) A	\$ 30%			CALIB	19 @17£	RRF) A	OR TAR						IME	ANAL	12/15	_	_	12/15	12/15	12/14	40/40
	GENERAL QAVO	GC/MS TUNING:	DETPP TUNING	DETPP TUNING		INITIAL CALIBRATION: (12/14/89)	SPDD (MEAN RRF) AND CCC (%RSD) CRITERIA MET	RSD EXCEEDS 30% FOR TARGET CMPD BENZOIC ACID (31.2%),			CONTINUING CALIBRATION:	CCAL (12/14/89 @1753)	SPDD (MEAN RRF) AND CCC (%D) CRITERIA MET	RSD > 25% FOR						HOLDING TIME	EXT	12/08	12/08		12/08	12/08	12/08	40,00
	GENE	GC/MS	DFTPF	DFTPF		INITIA	SPDD	RSD E			CONT	CCAL	SPDD	RSD >							TAKEN	11/28	11/28	11/28	11/28	Ϋ́	N A	Y IV
		_	I _	ī													10	1	(%)	TBP	ε	66	86	105	109	81	106	0
3Y AL		RANGES	RPD		9 42	23 40	7 28	16 38	8 28	7 42	18 31	0 50	6 38	3 50	27 31		FLAG: NONE		VERY	2FP	0	8	99	62	71	67	83	73
GOME		L	REC.		12-89	27-123	06-97	41-116	39-88	23-97	46-118	10-80	24-96	09-103	26-127		FLAG		E RECC	I PHL	9	72	7	7	74	72	11	32
CH2M HILL/MONTGOMERY AL	(TA	Y RPD	<u>8</u>		-7	φ	0	φ	10	15	5	7	9	17	34				SURROGATE RECOVERY (%)	TPH	<u> </u>	75	77	84	78	86	86	a
M HILL	NOIS	RECOVERY	GSW S		73	89	69	66	99	. 64	7	103	92	62	. 61	<u></u>	_		SUR	Z FBP	<u>@</u>	79	92	92	6	86	92	G
CHZ	PRECIS	RE	SM CI		68	64	69	ne 93	73	75	75	100	86	74	86	G (ACI	G (B/N	DATA		NBZ	(a)	75	73	9	72	79	91	73
	Y and		MPOUN				9	pylamii	ene	phenol						30 UG/K	to UG/K	QAVQC		SITE	CATIO	1 (1-2')	· · -	Ţ	Ţ	1-MS	1-MSD	
ΑY	CURAC		KECO			loui	benzen	i-n-pro	robenz	methyl	91	<u>0</u>	quene	oheno		L = 876	L = 438	ECIFIC		ਲ	DENTIF	BK-SL-1 (1-2')	BK-SD-1	DG1-SD-1	DG2-SD-1	K-SD-	K-SD-	Ν
LABORATORY	MS/MSD ACCURACY and PRECISION DATA		MATRIX SPIKE COMPOUND		0	2-Chlorophenol	1,4-Dichlorobenzene	N~Nitroso-di-n-propylamine	I,2,4-Trichlorobenzene	4-Chloro-3-methylphenol	Acenaphthene	4-Nitrophenol	2,4-Dinitrotoluene	Pentachlorophenol	96	SPIKE LEVEL = 8760 UG/KG (ACID)	SPIKE LEVEL = 4380 UG/KG (B/N)	SAMPLE SPECIFIC QA/QC DATA		9	NUMBER IDENTIFICATION				14959004 D	14959M05 BK-SD-1-MS	14959D06 BK-SD-1-MSD	
LABC	MS/N		MAT		Phenol	2-C	1,4-C	N-N	1,2,4-	수 다	Aceni	4-Nit	2,4-C	Penta	Pyrene	SPIK	SPIK	SAM		LAB	N O N	14959001	14959002	14959003	1495	14958	14958	S12089B1

F-13

⁽c) TPH - Terphenyl (33-141) (d) PHL - Phenol (10-94) (a) NBZ – Nitrobenzene (35–114) (b) FBP – 2-Fluorobiphenyl (43–116)

⁽e) 2FP – 2–Fluorophenol (21–100) (f) TBP – 2,4,6–Tribromophenol (10–123)

TABLE 2.4; QA/QC DATA FOR THE PURGEABLE HALOCARBONS AND AROMATIC COMPOUNDS ANALYSIS - EPA METHODS 8010/8020

MATRIX CASE NUMBER 7 LABORATORY C	4 LOW SOILS 73770 CH2M HiII/GAINSVILLE FL	LS 3AINSV	TLLE FL													
JRACY and PRE	SISION DA	TA			GENERAL QAQC	N/QC										55.4
·	ニニ		⊢	RANGES	INITIAL CALIBRATION	IBRATION:							GENERAL	GENERAL COMMENTS:		
MATRIX SPIKE COMPOUND	MS WSD	02 (%)	-	REC. RPD	GC#1; ALL GC#2; ALL I	GC#1; ALL ICAL CRITERIA MET GC#2; ALL ICAL CRITERIA MET										
CHLOROMETHANE			34 D-193													
CHLOROETHANE	106.0 91 87.7 7.1	71.3	15 D-144 20 46-137	© ©												
1,1-DICHLOROETHENE					CONTINUING	G CALIBRATION:	!									
METHYLENE CHLORIDE		•	18 25-162		GC#1; ALL (GC#1; ALL CCAL CRITERIA MET										
ш		86.5	5 38-155		GC#2; ALL CC	SCAL CRITERIA MET							FIELD DUP	FIELD DUPLICATE PRECISION	ISION:	
1,1-DICHLOROE HANE	107.0 99.0	99.0	4 40-133	<u>۔ ۔ و</u>										JUPLICATES	NO FIELD DOPLICALES WERE COLLECTED	
ETHANE			-1 51-147													
Ä																
		.5	3 43-143													
1,2-DICHLOROPROPANE	116.5 112.0	0.5	3 44-156													
TRICHLOROETHENE/	107.5 104.3	5.3	3 35-146		SAMPLESP	SAMPLE SPECIFIC QA/QC DATA							0.00			
	107.5 104.3	1.3	3 42-172	(C)			%) SHER BEC	_			INT	CONTAMIN	I. METHOD	No. OF	GENERAL COMMENTS,	
		0.	4 22-178		LAB	SITE	BCM	$\overline{}$	z		STD МТН		ᇳ	€ ŀ	BLANK CONTAMINATION,	
		3.5	8 22-178	(O)	NUMBER	IDENTIFICATION	(a)	(p)	TAKEN AN	_	(N/N)	N) (N	_	10L	SAMPLE SPECIFIC FLAGS	7
		5.0		_	73770	BK-SL-1 (1-2')							1VB1206AH	0		
Ν		5.5	8 24-191		73771	BK-SD-1							1VB1206AH	0		
DETHENE					73772	DG1-SD-1							1VB1206AH	0		
			•	-	73773	DG2-SD-1			m				1VB1206AH	0		
			w		73770MS	BK-SL-1 (1-2') MS		115.0					1VB1206AH	0		
TERT-BUTYL METHYL ETH	•				73770MSD			129.0	•				1VB1206AH	0 (
BENZENE	•				/3//0MSU2			0.81	Y Y	90/21	Z	z	1VB1206AH	Y 2		
OULOBORINGEN	103.4 104.0		0 40-148		1VB1200AH	4 2) (a) (b) (c)	0.00	·				₹ 2			
ETHYI BENZENE				93	1VB12065H			5 5	,				(4			
mo_XXI ENE					1VB1203011			2 5	•		. Z	. z	K N	Y 2		
O-XYI ENE				9 9				2					į			
1.3-DICHLOROBENZENE			2													
1.4-DICHLOROBENZENE																
1,2-DICHLOROBENZENE			-10 37-154													
SAMPLE = 73770 SPIKE EVEL = 400 116.1																
(a) BCM - BROMOCHI OBOMETHANE (65-135)	THANE (6	5-135)		(h) TF	T - A A A TRIFILIC	(h) TET - A A A TRIFI UOBOTOI UENE (65-135)										٦
(c) NO ESTABLISHED CRITERIA	V	<u>.</u>														

TABLE 2.5; QA/QC DATA FOR THE PURGEABLE HALOCARBONS AND AROMATIC COMPOUNDS ANALYSIS - EPA METHODS 601/602

	MATRIX CASE NUMBER LABORATORY	11 LOW 73861 CH2M F	11 LOW WATERS 73861 CH2M HILL/GAIN	11 LOW WATERS 73861 CH2M HILL/GAINSVILLE FI															
	JRACY and PRE	SCISION	V DATA				GENERAL QAQC	NOC											
		RECOVERY	VERY	RPD	RANGES	П	INITIAL CALIBRATION:	IBRATION:							GENI	ERAL CO	GENERAL COMMENTS:		
	MATRIX SPIKE COMPOUND	MS	MSD	(%)	REC. RPD	<u> </u>	GC#1; ALL I	GC#1; ALL ICAL CRITERIA MET GC#2: ALL ICAL CRITERIA MET											
	CHLOROMETHANE	86.0	63.5	30	D-193 NA														
	VINYL CHLORIDE	88.1	75.8	15 28-163															
	BROMOMETHANE	86.9	80.9	7 D-															
	CHLOROETHANE	88.4	84.5		_										\neg				
	1,1-DICHLOROETHENE	68.3	0.07	-2 28-167			CONTINUING	G CALIBRATION:		,									
	METHYLENE CHLORIDE	65.3	68.5	-4 25-162			GC#1; CCAL	GC#1; CCAL CRITERIA MET. EXCEPT; CH3CI (67%,12/10/89)	CEPT; C	H3CI (6:	7%,12/10	(68/			į		700	14000	
	1-1,2-DICHLOROETHANE	82.4 5.5	83.5	-2 38-135	38-155 NA 47-132 NA		GC#Z; CCAL	GC#2; CCAL CHI EHIA MEI : EACEPI; VC (35%, 12/06/89)	CEP1.	(33%) (33%)	12/00/89,	_			NO FIEL	FIDE	FIELD DOPLICATE PRECISION: NO FIFT DIDITION ICATES WEBF	FIELD DOPLICATE PRECISION: NO FIELD DUPLICATES WERE COLLECTED	
F	CHLOROFORM	91.1	88.5	2 49-133											! :				
-1	1,1,1-TRICHLOROETHANE	88.3	85.0	3 41-	41-138 NA														
5	CARBON TETRACHLORIDE	94.2	91.6	2 43-143	143 NA														
	1,2-DICHLOROETHANE	88.5	88.9	0 51-147															
	TRICHLOROETHENE	101.0	98.5	2 35-146															
	1,2-DICHLOROPROPANE	97.2	94.6	2 44-156			SAMPLE SPE	ECIFIC QA/QC DATA					: I		7.8				
	BROMODICHLOROMETHAN	101.9	88.9	13 42-172					SURR	SURR REC (%)			_	CONTAMIN		METHOD	No. OF	GENERAL COMMENTS	NTS,
	c-1,3-DICHLOROPROPENE	8.96	89.4	7 22-178			LAB	SITE	BCM	THT	Z	G TIME	STD N	_		BLANK	딑	BLANK CONTAMINATION	TION,
	t-1,3-DICHLOROPROPENE	6.96	96.1	0 22-178			NUMBER	IDENTIFICATION	(a)	-	TAKEN	ANAL	\neg	(Y/N) (Y/N)	\dashv		TCL TIC	SAMPLE SPECIFIC FLAGS	LAGS
	1,1,2-TRICHLOROETHANE	98.1	101.6	-3 39-136			73861	7-GW-WP5A	110.0	103.0	12/01	12/06	٧			2VB1206A			
	TETRACHLOROETHENE	100.8	102.1	-1 26-162			73862	7-GW-WP2A	100.0	100.0	12/01	12/06	٧			2VB1206A	O NA		
	DIBROMOCHLOROMETHAN	101.7	102.7				73863	3W-GW-WP5A	105.0	101.0	12/01	12/06	Ϋ́			2VB1206A			•
	вномогоям	101.1	103.4	•			73864	DG1-SW	95.0	100.0	12/01	12/06	Ϋ́Z			2VB1206A			
	1122-TETRACHLOROETHA	115.9	120.3		4		73865	DG2-SW	103.0	0.68	12/01	12/06	¥:			2VB1206A	NA 0		
	TERT-BUTYL METHYL ETH	104.6	102.2				73866	2-GW-WP13	_	98.0	12/01	12/07	¥ :			2VB1206A			
	BENZENE	88.4	87.8				73867	POTABLE DECON		101.0	12/01	12/07	¥ :			2VB1206A			
	IOLUENE Oui Obobenzene	9.0	5 5 5 5 6		148 NA		/3868	2-GW-WP12	106.0	104.0	10/21	70/21	¥ :	 	N 2VB	2VB1206A	2 2		
	CTLO DENZENE	9 6	9 5	091-00-1-			72070	DAILER DLAIN	0.00	0.00	10/01	10/01	{			2 VB1206A			
	mo-XVI FNF	101.6	1001				73871	TRIP BLANK	108.0	1010	12/01	19/07	۲ م د ع			2VB1206A			
	O-XXI ENE	102.7	102.4				73861MS	7-GW-WP54 MS	1100	2 8	Y V	12/07	(4 2 Z			2VB1206A			
	1,3-DICHLOROBENZENE	107.0	106.7	ŭ			73861MSD	7-GW-WP5A MSD			¥	12/07	¥			2VB1206A			
_	1,4-DICHLOROBENZENE	108.5	105.8	2 42-143			2VB1206A	NA AN			AN	12/06	Ą	z		AN		NO CONTAMINANTS FOUND	OND
	1,2-DICHLOROBENZENE	107.3	107.9	0 37-154	154 NA		1VB1210A	AN	115.0	115.0	NA A	12/10	ΑN			NA A	O NA	NO CONTAMINANTS FOUND	OND
	SAMPLE = 73861																		
	SPIKE LEVEL = 100 UG/L																		
	(a) BCM - BROMOCHLOROMETHANE (65-135)(c) NO ESTABLISHED CRITERIA	IETHAN 31A	IE (65-1:	35)	(q)	ΓFT – A	A.A.TRIFLUO	(b) TFT – A.A.A.TRIFLUOROTOLUENE (65–135)	35)										

TABLE 2.6; QA/QC DATA FOR THE PURGEABLE HALOCARBONS AND AROMATIC COMPOUNDS ANALYSIS - EPA METHODS 601/602

CASE NUMBER LABORATORY	73952 CH2M Hill/GAINS	iii/GAIN	73952 CH2M HII/GAINSVILLE FL															
JRACY and PRE	SION	ATA				GENERAL QA/QC	4/QC											
MATRIX SPIKE COMPOUND	RECOVERY MS MS	\vdash	RPD RANG (%) REC.	RANGES IEC. RPD		INITIAL CALIBRATION GC#1; ALL ICAL CRITE GC#2; ALL ICAL CRITE	INITIAL CALIBRATION: GC#1; ALL ICAL CRITERIA MET GC#2; ALL ICAL CRITERIA MET				i			GENE	RAL COI	GENERAL COMMENTS:		
CHLOROMETHANE	42.9	73.9	-53 D-193	193 NA														
VINYL CHLORIDE	7.67	104.1	-26 28-163	163 NA		CONTINUING	a CALIBRATION:							FIELD	OUPLIC/	FIELD DUPLICATE PRECISION	NOISI	
BROMOMETHANE	73.8	86.2	-15 D-144			GC#1; ALL C	GC#1; ALL CCAL CRITERIA MET							73952 & 73959	73959			
CHLOROETHANE	7.07	102.0	-36 46-137	_		GC#2; ALL C	GC#2; ALL CCAL CRITERIA MET							739970	739970 & 73971			
1,1-DICHLOROETHENE	105.3	91.8	13 28-167	167 NA														
METHYLENE CHLORIDE	122.3	115.6	5 25-162			SAMPLE SPE	SAMPLE SPECIFIC QA/QC DATA					ı		- }	-			_
t-1,2-DICHLOROETHENE	100.7	107.3	-6 38-155					SURR REC (%	3EC (%)					<u>~</u>		No. OF	GENERAL COMMENTS,	
1,1-DICHLOROETHANE	8.66	102.2	-2 47-132	132 NA		LAB	SITE	BCM	TFT	フリ	G TIME	STD		<u>교</u>	_!	<u>a.</u> ⊦	BLANK CONTAMINATION,	
CHLOROFORM	103.1	98.4	4 49-133			NUMBER	IDENTIFICATION	(a)	(q)	TAKEN	ANAL	\neg	5	9	-		SAMPLE SPECIFIC FLAGS	
1,1,1-TRICHLOROETHANE	102.2	104.6	-2 41-138	138 NA		73952	3E-GW-MW1	Ξ	26	12/04	12/10	ΑN						
CARBON TETRACHLORIDE	101.4	101.0	0 43-143	143 NA		73955	1-GW-MW1	93	66	12/05	12/09	ΑN		•	0 Y60			
1,2-DICHLOROETHANE	113.3	112.4	0 51-147	147 NA		73956	1-GW-MW2	=======================================	102	12/05	12/09	Ϋ́	z	N 2VB1209A				
TRICHLOROETHENE	113.5	111.0	2 35-146	146 NA		73957	POT DECON WTR C.E.	93	66	12/05	12/10	ΑN		•		3 NA		
1,2-DICHLOROPROPANE	97.3	8.76	0 44-156	156 NA		73959	3E-GW-MW3	11	102	12/04	12/10	۲		N 2VB1209A				
BROMODICHLOROMETHANE	96.0	100.6	-4 42-172	172 NA		73960	3E-GW-MW2	100	101	12/04	12/10	¥						
c-1,3-DICHLOROPROPENE	90.5	92.3	-1 22-178	178 NA		73961	5-GW-MWB	95	101	12/04	12/10	٧				O NA		
t-1,3-DICHLOROPROPENE	92.1	93.8	-1 22-178	178 NA		73962	5-GW-MWC	92	101	12/04	12/10	¥			_			
1,1,2-TRICHLOROETHANE	99.3	102.8	-3 39-136	136 NA		73963	5-GW-MWA	88	100	12/04	12/10	Ϋ́			-	2 NA		
TETRACHLOROETHENE	121.9	122.8	0 26-162	162 NA		73955MS	1-GW-MW1	93	66	12/05	12/10	Ϋ́			_	AN 0		
DIBROMOCHLOROMETHANE	94.4	97.9	-3 24-191	191 NA		73955MSD	1-GW-MW1	93	66	12/05	12/10	Ϋ́		••				
ВВОМОБОВМ	90.2	98.9	-9 13-159	159 NA		73964	BAILER BLANK #2	112	101	12/04	12/10	Ϋ́			_			
1122-TETRACHLOROETHAN	95.8	106.4	-10 8-184	184 NA		73965	TRAVEL BLANK	113	102	12/04	12/10	Ϋ́		•				
TERT-BUTYL METHYL ETHE	87.9	95.9	(c) -8			73966	5-GW-MW1	=======================================	97	12/05	12/10	Ϋ́		,				
BENZENE	103.4	103.9	0 39-150	150 NA		73967	5-GW-MW2	107	66	12/05	12/10	¥ Z		•				
TOLUENE	101.9	102.2	0 46-148			73968	8-GW-MW3	106	97	12/05	12/10	Ϋ́	z	•				
CHLOROBENZENE	97.1	8.86	-1 55-135			73969	8-GW-MW2	120	66	12/05	12/10	¥ Z						
ETHYL BENZENE	100.0	100.2	0 32-160	160 NA		73970	8-GW-MW1	100	101	12/05	12/11	ΑN			_			
mp-XYLENE	101.4	101.7	0	(c) NA		73971	8-GW-MW4	93	86	12/05	12/11	¥						
o-XYLENE	98.1	98.6	0	(c) NA		73972	BAILER BLANK #3	103	66	12/05	12/10	ΑN		₹				
1,3-DICHLOROBENZENE	8.86	101.4	-2 50-141	141 NA		NA A	2VB1209A	95	97	ΑN	12/09	Ϋ́						
1,4-DICHLOROBENZENE	100.2	101.0	0 42-143	143 NA		A N	1VB1210A	115	115	ΑΝ	12/10	Ϋ́						
1,2-DICHLOROBENZENE	98.3	98.9	0 37-154	154 NA		AN	1VB1211A	95	97	Ϋ́	12/11	Ϋ́				O NA		
						٨	2VB1212A	105	103	Ϋ́	12/12	Ϋ́	N A N	NA NA		¥N 0		
SAMPLE = 73955																		
SPIKE LEVEL = 100 UG/L																		\neg
(a) BCM - BROMOCHLOROMETHANE (65-135)	THANE	(65–13	2)	(a)	FT - A.	(b) TFT - A.A.A.TRIFLUOI	ROTOLUENE (65-135)											
(c) NO ESTABLISHED CRITERIA	≝																	

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using dual photoionizing and electrolytic conductivity detectors. Because of this modification the QA/QC data are described together.

Trip blanks were submitted with the field samples. The trip blank consists of ASTM Type II water that is prepared in the laboratory prior to the sampling event. The water is stored in VOA bottles, remains closed in the field, and travels back to the laboratory with the other VOA GC and GC/MS samples. The blank indicates possible contamination introduced during the shipping, handling and storage of the samples. The usual frequency is one trip blank per shipping container.

No surrogate recovery control limits are established for this method; therefore, the performing laboratory uses its surrogate recovery control charts to establish control limits.

The decontamination water used for primary equipment wash was contaminated with bromodichloromethane, dibromochloromethane, and chloroform. No qualification of the data set was applied because the decontamination water was not used in the final step of equipment decontamination.

Table 2.4 summarizes the QA/QC data for four low concentration soil samples. The laboratory narrative described problems with chloroform contamination at levels less than 2 ppb although chloroform was not found in the daily method blank analysis. Due to the potential presence of the contaminant, all samples reporting chloroform less than 20 ppb were flagged "B."

Continuing calibration percent difference criteria were not met for chloroform (62 percent) or methylene chloride (25 percent, December 6). Because chloroform and methylene chloride were not found in any of the samples there was no further qualification. All other QA/QC measures were met and the data are acceptable.

Table 2.5 summarizes the QA/QC data for 11 low concentration water samples. All QA/QC measures were met, and the data are acceptable.

Table 2.6 summarizes the QA/QC data for 18 low concentration water samples.

Sample 73957 (Potable Decon Water C.E.4) contained chloroform (19 μ g/l), dichlorobromomethane (7.6 μ g/l), and dibromochloromethane (2.9 μ g/l). The potable decontamination water was contaminated, as discussed above, but all other QA/QC measures were met and the data are acceptable for use.

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2.2.5 Polynuclear Aromatic Hydrocarbons

No specific surrogate or matrix spike compounds are required in the method. The compounds reported are PNA compounds or representative of the PAH group of compounds and are, therefore, appropriate. Acceptance ranges for matrix spike and surrogate recoveries are selected from EPA Method 8270. No acceptance ranges for MS/MSD precision are established. The reviewer used professional judgment to evaluate precision.

Table 2.7 summarizes the QA/QC data for 12 low concentration water samples. All QA/QC measures were met, and the data are acceptable.

3.0 WET CHEMISTRY

Samples analyzed by wet chemistry methods do not have format-specific deliverables. The data review consisted of checking that the following QA/QC was performed and acceptable: initial calibration or calibration verification, MS/MSD, laboratory blank, blank spike, and control charts.

Table 3.1 summarizes the TSS data for two low concentration water samples. Table 3.2 summarizes the total hardness data for the same samples. All QA/QC measures were met, and the data are acceptable.

4.0 METALS ANALYSES

4.1 INTRODUCTION

Metal analyses data were reviewed and validated using HAZWRAP Level C Data Validation Guidelines and supplemented using the guidance document "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" [6]. The required data deliverables, as specified under Level C, are laboratory control charts and forms used in the CLP SOW. The forms summarize the raw, experimental data.

Form I--Data Sheet presents the sample results and is reviewed for completeness.

Form IIA--Initial and Continuing Calibration Verification is used to report analyte recoveries from calibration solutions. Initial calibration data demonstrate that the analytical instrument is performing satisfactorily and is capable of producing acceptable quantitative data at the beginning of the analytical period.

TABLE 2.7; QA/QC DATA FOR THE POLYNUCLEAR AROMATIC COMPOUND ANALYSIS - EPA METHOD 610

	GENERAL COMMENTS:		FIELD DUPLICATE PRECISION NO FIELD DUPLICATES WERE COLLECTED			CONTAMIN. METHOD No. OF GENERAL COMMENTS,
GENERAL DAVOC	GC/MS TUNING: NO INFORMATION PROVIDED	INITIAL CALIBRATION: ALL MEAN RRF AND %RSD CRITERIA MET	CONTINUING CALIBRATION: ALL MEAN RRF AND %D CRITERIA MET			INTERNAL STANDARD CONTAI
8 AND 6 LOW WATERS 14964001 AND 14988005 CH2M HIII/MONTGOMERY AL	RECOVERY RPD RANGES MS MSD (%) REC. RPD	66 69 -4 NA NA 87 85 2 NA NA 91 92 -1 NA NA				SURROGATE REC. (%)
MATRIX CASE NUMBER CASE NUMBER LABORATORY MSMSD ACCIDENCY and PRECISION DATA	MATRIX SPIKE COMPOUND	NAPHTHALENE ACENAPHTHYLENE PYRENE		SAMPLE = 14964006 SPIKE LEVEL = 100 UG/L	SAMPLE SPECIFIC QA/QC DATA	T-

LAB DENITION Calibration				SURRC	SURROGATE REC. (%)	REC. ((%					=	INTERNAL STANDARD	IL STA!	VDARE	_	NOO	CONTAMIN.	МЕТНОВ	No. OF	<u>ا</u>	GENERAL COMMENTS,	
SATION (a) —<	LAB	SITE	TPH	1	1	1	I	1	HOLD	NG TIR	m m	a.	ERFOR	MANCE	(%)		MTH	FLD	BLANK	CMF	sQ.	BLANK CONTAMINATION,	
54 105 NA NA NA NA NA 12/01 12/06 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		DENTIFICATION	(a)		I		I		1	_	ANAL	┝		\vdash	-	H	<u> </u>		_	TCL	⊇ E	SAMPLE SPECIFIC FLAGS	
24 102 NA NA NA 12/01 12/06 12/16 NA	14964001 7-	-GW-WP5A	105	ΑN	ΑN	ΑN	ΑN	ΥN			12/16							z	C12059B1	0	NA A		_
FFA 94 NA	14964002 7-	-GW-WP2A	102	Ϋ́	Ϋ́	¥	Ϋ́	Ϋ́		12/06	12/16	Y Y	N AN		_		z	z	C12059B1	0	¥		
102 NA NA NA NA NA NA 12/01 12/06 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		N-GW-WP5A	8	Ϋ́	Ϋ́	Ϋ́	ΑN	Υ		12/06	12/16	¥.	NAN	_	_		z	z	C12059B1	0	¥		
98 NA NA NA 12/01 12/06 12/16 NA		G1-SW	102	Ϋ́	¥	¥	٧	Ϋ́		12/06	12/16	Y.			_			z	C12059B1	o	¥		
ANK 105 NA NA NA NA 12/01 12/06 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		G2-SW	86	Y Y	¥	Ϋ́	ΑN	Υ			12/16	Y Y					z	z	C12059B1	0	¥		
ANK 105 NA NA NA NA 12/01 12/06 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		OT DECON WATE	9	Y Y	Ϋ́	ΑN	Ϋ́	Ϋ́		12/06	12/16	Ϋ́	N AN				z	z	C12059B1	0	Ą		
NK 104 NA NA NA NA NA 12/01 12/06 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		AILER BLANK	105	Ž	Ϋ́	Ϋ́	Α	Α		12/06	12/16	Ϋ́			_			z	C12059B1	0	¥		
98 NA NA NA NA NA NA NA 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		ELD BLANK	104	Y Y	Ϋ́	ΑN	Ϋ́	Υ		12/06	12/16	Ϋ́	N AN		_			z	C12059B1	0	¥		
N-MS 100 NA NA NA NA NA NA 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA	C12059B1 Q	CBLANK	86	Ϋ́	ΑN	Υ	Υ	ΑA	Ϋ́	ΑN	12/16	Ϋ́						z	C12059B1	0	Ą		
3		OT DECON-MS	100	Ϋ́	ΑN	Ϋ́	Ϋ́	Ϋ́	Ϋ́	Α	12/16	Ϋ́	NAN				_	z	C12059B1	0	¥		
3 102 NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		OT DECON-MSD	104	Ϋ́	ΑN	Ϋ́	Ϋ́	Ϋ́	A A	Ϋ́	12/16	¥						z	C12059B1	0	Y Y		
3 102 NA NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA																							
2 100 NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA	14988001 8-	-GW-MW3	102	Ϋ́	Υ	Υ	Ϋ́	Ϋ́		12/11	12/16	Y Y					z	z	C12119B1	0	A A		_
1 106 NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		-GW-MW2	100	Ϋ́	Ν	Ϋ́	Ϋ́	ΑĀ		12/11	12/16	Y Y	NAN			_	z	z	C12119B1	0	NA		
4 100 NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA NA NA NA NA C12119B1 0 ANK#3 100 NA NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		-GW-MW1	106	Υ	Υ	ΑN	ΑN	Ϋ́			12/16	AN	N A N					z	C12119B1	0	NA A		
ANK#3 100 NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA N N C C12119B1 0 N C.E.4 108 NA NA NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA N N C C12119B1 0 108 NA NA NA NA NA NA NA NA NA NA NA NA NA		-GW-MW4	100	Ϋ́	۷	Ϋ́	Υ	Ϋ́			12/16	NA	N AN					z	C12119B1	0	ΑĀ		
N.C.E.4 108 NA NA NA NA 12/05 12/11 12/16 NA NA NA NA NA NA N N. O.12119B1 0 108 NA NA NA NA NA NA NA 12/16 NA NA NA NA NA NA NA NA NA NA NA NA NA		AILER BLANK #3	100	Ϋ́	Ϋ́	Υ	٧	۲			12/16	٧	Z					z	C12119B1	0	N A		
108 NA NA NA NA NA NA 12/16 NA NA NA NA NA NA N N C12119B1 O		OT DECON C.E.4	108	ΑN	Ν	ΑN	Ϋ́	Ϋ́			12/16	Y Y						z	C12119B1	0	NA		
	C12119B1 Q	C BLANK	108	ΑN	ΑN	Ν	Υ	ΑN	Ν		12/16							z	C12119B1	0	ΑA		

TABLE 3.1; QA/QC DATA FOR THE TOTAL HARDNESS ANALYSIS - EPA METHOD 130.2

2 LOW WATERS 73952 to 73972

MATRIX CASE NUMBER

		ENTS:	INITIAL CALIBRATION BLANK (<1.0 mg/L)							PRECISION:	ATE COLLECTED							GENERAL COMMENTS,	BLANK CONTAMINATION,	SAMPLE SPECIFIC FLAGS			< 1.0 mg/L	
		GENERAL COMMENTS:	INITIAL CALIBRAT							FIELD DUPLICATE PRECISION	NO FIELD DUPLICATE COLLECTED							CONTAMIN, METHOD	BLANK	0	METHOD BLANK	METHOD BLANK	METHOD BLANK < 1.0 mg/L	
			CONTR				z	RITERIA			RATION	RITERIA						CONTAMIN	MTH FLD	(Y/N) (Y/N)	z	z	z	
		SE:	LABORATORY CONTROL SAMPLE EQUALS	₽Υ			SINGLE POINT INITIAL CALIBRATION	VERIFICATION MET ACCEPTANCE CRITERIA		TION:	SINGLE POINT CONTINUING CALIBRATION	VERIFICATION MET ACCEPTANCE CRITERIA						0	-					
)QC	METHOD PERFORMANCE:	Y CONTRC	97.1 PERCENT RECOVERY		INITIAL CALIBRATION:	T INITIAL (N MET AC	rcent)	CONTINUING CALIBRATION:	T CONTIN	N MET AC	rcent)						.IME	ANAL	12/12	12/12	12/12	
	GENERAL QA/QC	HOD PEF	JRATOR'	PERCEN		AL CALIE	ILE POIN	FICATIO	(90 TO 100 percent)	TINUING	LE POIN	FICATIO	(90 TO 100 percent)						HOLDING TIME	N EXT	4 NA	5 NA	¥	
	GEN	MET	<u> </u>	97.1		E	SING	VER	<u>8</u>	NOS	SING	VER	8	.005/2					¥	TAKEN	12/04	12/05	Ϋ́	
ILLE FL		RANGES	REC. RPD		0 65-135 NA											FLAG: NONE				 ,				
GAINSV	LA	RPD	8		0											_								
CH2M HILL/GAINSVILLE FL	ON DA	RECOVER RPD	MS MSD		98.5 98.5																			
CH2	PRECIS	RE	Ц.		98.												DATA			NO			¥	
ЭВҮ	MS/MSD ACCURACY and PRECISION DATA		MATRIX SPIKE COMPOUND		RDNESS									SAMPLE = 1-GW-MW2	SPIKE LEVEL = 100 MG/L		SAMPLE SPECIFIC QA/QC DATA		SITE	NUMBER IDENTIFICATION	3E-GW-MW1	1-GW-MW2	METHOD BLANK	
LABORATORY	MS/MSD A		MATRIXS		TOTAL HARDNESS									SAMPLE =	SPIKE LEV		SAMPLES		LAB	NUMBER	73952	73956	¥ Y	

TABLE 3.2; QA/QC DATA FOR THE TOTAL SUSPENDED SOLIDS ANALYSIS - EPA METHOD 160.2

GENERAL COMMENTS: INITIAL CALIBRATION BLANK (<1.0 mg/L)		FIELD DUPLICATE PRECISION: NO FIELD DUPLICATE COLLECTED		GENERAL COMMENTS, BLANK CONTAMINATION,			< < 1.0 mg/L	
GENERAL COMMENTS:	·	NO FIELD DUPLICATE PRECISION: NO FIELD DUPLICATE COLLEC		METHOD BLANK		METHOD BLANK	METHOD BLANK	
				CONTAMIN METHOD MTH FLD BLANK	(Y/N) (Y/N)	z		
GENERAL QA/QC METHOD PERFORMANCE:	INITIAL CALIBRATION:	CONTINUING CALIBRATION:		HOLDING TIME	EXT ANAL	NA 12/12		
	NA INITIAL O	OOUTIN		HOLD	TAKEN	12/04	NA	
TERS 3972 JGAINSVILLE FI RPD RANG (%)	264 302 13.4 N		DATA		N		¥	
MATRIX CASE NUMBER 13962 to 73 LABORATORY SAMPLE DUPLICATE PRECISION DATA CONC. SAMPLE COMPOUND 1 2	TSS	SAMPLE = 1-GW-MW2	SAMPLE SPECIFIC QA/QC DAT	LAB	E.	73952 3E-GW-MW1		

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Continuing calibration checks document that the instrument continues to produce acceptable data. Calibration spike recoveries must fall within a tight acceptance window for analysis to begin or continue.

Form IIB--CRDL Standard for AA and ICP is used to report analyte recoveries from analyses of the Contract Required Detection Limits (CRDL) standards for AA and ICP. The laboratory analyzes a standard solution that is twice the Instrument Detection Limit (IDL) to verify the linearity of the instrument at low detection limits.

Form III-Blanks is used to report analyte concentrations detected in the Initial Calibration Blank (ICB), Continuing Calibration Blanks (CCB), and the Preparation Blank (PB). Method blanks are used to monitor the existence and magnitude of contamination problems. If problems with any blank exist, all data associated with that sample delivery group must be carefully evaluated to determine if there is a problem with the entire analytical group or if it is an isolated incident.

Form IV--ICP Interference Check Sample (ICS) is used to report ICS results for each ICP instrument used. The ICS is a mixture of analytes that have a potential for interference and is performed to verify the laboratory's interelement and background correction factors.

Form VA--Spike Sample Recovery is used to report results for the pre-digestion spike recovery. This spike recovery measurement is analogous to the MS/MSD spike recovery for organic analyses in that it measures the effects of the sample matrix on the recovery of a known quantity of analyte. Additionally, it also measures the efficiency of the digestion process. If the pre-digestion spike recovery does not fall within preset limits (usually 75 to 125 percent), then a post-digestion spike is added and the sample reanalyzed.

Form VB--Post-Digestion Spike Sample Recovery is used to report recovery results for the above mentioned post-digestion spike. Again, the established acceptance limit for recovery is 75 to 125 percent. If both the pre- and post-digestion spike recovery is outside the acceptance limits, this is considered positive evidence of matrix interferences, and the data are flagged "J."

Form VI--Duplicates is used to report the results of duplicate laboratory analysis rather than a field duplicate. This duplicate differs from the MSD used in organic analyses in that the analyte concentration measured is native to the sample rather than that which has been added (spiked). Duplicate analyses are required for calculating percent solids (for soil samples) and all analyte results.

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Duplicate data are used to calculate precision for all analyte concentrations greater than five times the CRDL. Acceptance limits are set at 0 to 20 percent.

Form VII--Laboratory Control Sample (LCS) is used to report the recovery results for the standard LCS. The LCS analysis is designed to serve as a monitor of the efficiency of the digestion procedure, and analyte recoveries must fall within acceptance limits (usually 90 to 110 percent).

Form VIII--Standard Addition Results is used to report the results of samples analyzed using the Method of Standard Additions and is only used for Graphite Furnace Atomic Absorption Analysis. Duplicate injections and furnace post-digestion spike recoveries are used to establish the precision and accuracy of the individual analytical determinations. For all analyte concentrations greater than 5 times the CRDL, acceptance limits of 0 to 20 percent relative standard difference have been established in the CLP SOW.

Form IX--ICP Serial Dilution is used to report results for ICP serial dilution which determines whether significant physical or chemical interferences exist due to sample matrix effects. For any analyte whose concentration is 50 times greater than the IDL, the sample is diluted and the results compared (diluted versus undiluted) for agreement (precision).

Form X--Holding Times is used to report holding times for mercury (28 days) and cyanide (14 days). Samples that are not analyzed within the holding times are flagged "L" to indicate low bias.

Form XI--Instrument Detection Limits (Quarterly) documents the quarterly IDL study conducted by the laboratory for each instrument used to produce the data package. Additionally, the raw experimental and supporting documentation are reviewed thoroughly for analyte quantitation and reported detection limits, strip chart recordings, and instrument data system printouts.

4.2 INORGANIC DATA VALIDATION SUMMARY TABLES

Each table presents the validation information for one sample delivery group and sample matrix. Data nonconformances are flagged and the nonconformance is discussed in the corresponding text section. The flags are also included on the data summary tables so that the possible limitations of data quality will be considered before the data is used to support project decisions. Control limits are delineated in the appropriate method or utilized from the CLP SOW [6] when the method does not have established control limits. The text is organized by sample delivery groups.

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The summary tables for a given analytical method are presented by laboratory number (in ascending sequential order). The data validation summary tables are discussed by category below in the same order that they appear.

The holding times reported for mercury analysis are acceptable. No holding times were reported for the remaining elements, which are assumed to be met because the data reporting date preceded holding time expiration.

Table 4.1 summarizes the QA/QC data for 10 low concentration water samples.

Matrix spike recovery for selenium (70.5 percent) was below acceptance criteria and flagged "L." The post spike recovery was within criteria. The reported concentration and quantitation limit for selenium is estimated in all samples. No samples reported selenium concentrations greater than the CRDL. The preparation blank contains barium (2.0 μ g/l) and lead (1.7 μ g/l). Samples containing these elements at concentrations less than five times the amount in the preparation blank are flagged "B."

Table 4.2 summarizes the QA/QC data for 13 low concentration soil samples.

Matrix spike recovery for arsenic (70.4 percent) was below acceptance criteria and flagged "L." The post spike recovery was within criteria. The reported concentration and quantitation limit for arsenic is estimated in all samples. No samples reported arsenic concentrations greater than the CRDL. All other QA/QC measures were met, and the data are acceptable.

Table 4.3 summarizes the QA/QC data for nine low concentration water samples.

Matrix spike recoveries were performed on samples 14996003 and 14996006. In sample 14996003 the matrix spike contained lead and the recovery was acceptable. In sample 14996006 the matrix spike contained iron and lead. Spike recovery was above acceptance criteria and flagged "K" for iron (596.5 percent), was below acceptance criteria and flagged "L" for lead (58.2 percent). The native concentration of iron exceeded the amount of iron added as a spike and contributed to the poor recovery. The laboratory report also cites that the sample contained large amounts of solids/sediments. A post spike was performed at an appropriate spike concentration, and the recovery for iron and lead was within criteria. Only the iron and lead concentrations in sample 14996006 were flagged on the basis of matrix spike recoveries.

The preparation blank contained iron (50.1 µg/l). Samples containing iron at concentrations less than five times the amount in the preparation blank were flagged "B."

TABLE 4.1; QA/QC DATA FOR SELECTED INORGANIC METALS ANALYSIS

MATRIX

: 10 LOW WATERS

CASE NUMBER

: 14969

LABORATORY

: CH2M Hill/MOMTGOMERY AL

LADORATOTTI . C	OTIZW TRIDWOWT GOWETT AL
PERFORMANCE QA/QC	
INITIAL CALIBRATION	ICAL BLANK
MULTIPOINT CALIBRATION NOT PROVID	DED ICAL 1; Cd(-1.9 ug/l)
ICAL VERIFICATION MET CRITERIA	
CONTINUING CALIBRATION	PREP BLANK
CCAL VERIFICATION MET CRITERIA	Ba(2.0 ug/l), Pb(1.7 ug/l)
	Se(-1.1 ug/l)
INTERFERENCE CHECK SAMPLE	CONTINUING BLANK
ICS MET CRITERIA	CCAL 1-2; Cd(1.9 ug/l), Cr(-5.9 ug/l)
1	

		CRDL	IDL	LCS REC	OVERY	SPIKE R	ECOVERY	(%)	DUP. PRE	CISION	SER.DIL.	PREP BLK
ELEMENT	METHOD	(ug/l)	(ug/l)	(%)	LIMIT	PRE	LIMIT	POST	(%RPD)	LIMIT	(%D)	(ug/l)
ARSENIC	GFAA	10	0.3	107.1	80-120	98.4	75-125	110.4	NA	+/-20%	NA	NA
BARIUM	ICP	200	8.0	98.7	80-120	100.9	75–125	NA	2.7	+/-20%	NA	2
CADMIUM	ICP	5	1.6	92.5	80-120	88.5	75-125	NA	NA	+/-20%	NA	NA
CHROMIUM	ICP	10	5.5	93.0	80-120	97.7	75-125	NA	NA	+/-20%	NA	NA
LEAD	GFAA	5	0.9	96.9	80-120	97.4	75-125	111.5	NA	+/-20%	NA	1.7
MERCURY	CV	0.2	0.2	99.6	80-120	118.4	75-125	NA	NA	+/-20%	NA	NA
SELENIUM	GFAA	5	1.1	88.5	80-120	70.5	75-125	103.6	NA	+/-20%	NA	-1.1
SILVER	ICP	10	6.7	94.5	80-120	83.5	75-125	NA	NA	+/-20%	NA	NA
i												

						CONTAMI	NANT	GENERAL COMMENTS
LAB	SITE	SAMPLE	HOLDING	G TIME		FLD	PREP	BLANK CONTAMINATION
NUMBER	IDENTIFICATION	TAKEN	HG PREP	CN-	OTHERS	(Y/N)	(Y/N)	SAMPLE SPECIFIC FLAGS
4969001	6-GW-MW1	12/01	NA	NA	NA	N	N	
4969002	6-GW-MW2	12/01	NA	NA	NA	N	N	
4969003	7-GW-WP5A	12/01	NA	NA	NA	N	Υ	Pb flagged B
4969004	7-GW-WP2A	12/01	NA	NA	NA	N	Y	Pb flagged B
4969005	3W-GW-WP5A	12/01	NA	NA	NA	N	N	
4969006	DG1-SW	12/01	12/11	NA	NA	N	N	
4969007	DG2-SW	12/01	12/11	NA	NA	N	Y	Pb flagged B
4969008	POTABLE DECON WATER	12/01	12/11	· NA	NA	N	Y	Pb flagged B
4969009	BAILER BLANK	12/01	12/11	NA	NA	N	N	
4969010	FIELD BLANK	12/01	12/11	NA	NA	N	N	

TABLE 4.2; QA/QC DATA FOR SELECTED INORGANIC METALS ANALYSIS

MATRIX

: 13 LOW SOILS

CASE NUMBER

: 14969

LABORATORY : CH2M Hill/MOMTGOMERY A					AL								
PERFORMANC	EQNQC												
INITIAL CALIBR	RATION				ICAL BLANK								
MULTIPOINT C	ALIBRATION			Cd (-1.9 ug/l)									
ICAL VERIFICA	TION MET CR	ITERIA									M		
CONTINUING	ALIBRATION					PREP BLANK							
CCAL VERIFICA	ATION MET C	RITERIA											
	- OUTOK 041	4D) F				CONTINU	ING PLANE				··		
INTERFERENC		MPLE				CONTINUING BLANK							
ICS MET CRITE	RIA					CBLK 1-2; Ca (-2.4 ug/l)							
						CBLK 2-1;	Ca (3.4 ug	/I)				1.	
SELECTED		CRDL	IDL	LCS REC	OVERY	SPIKE RECOVERY (%)		DUP. PRECISION		SER.DIL.	PREP BLK		
ELEMENT	METHOD	(mg/Kg)	(ug/l)	(%)	LIMIT	PRE	LIMIT	POST	(%RPD)	LIMIT	(%D)	(mg/Kg)	
ARSENIC	GFAA	1	0.3	75.7	80-120	70.4	75–125	100.0	19.8	+/-35%	NA	NA	
BARIUM	ICP	20	8.0	106.2	80-120	94.3	75-125	NA	19.9	+/-35%	NA	0.002	
CADMIUM	ICP	5	1.6	80.0	80-120	92.8	75-125	NA	NA	+/-35%	NA	0.002	
СНЯОМІИМ	ICP	10	5.5	88.4	80-120	97.0	75-125	NA	9.9	+/-35%	NA	NA	
LEAD	GFAA	0.5	9	95.6	80-120	98.9	75-125	112.0	33.4	+/-35%	NA	0.174	
MERCURY	CV	0.02	0.2	90.6	80-120	85.3	75-125	NA		+/-35%	NA	NA	
SELENIUM	GFAA	0.5	1.1	61.5	80-120	78.4	75–125	98.0	-	+/-35%	NA	-0.113	
SILVER	ICP	1	6.7	84.2	80-120	76.7	75–125	NA		+/-35%	NA	NA	
1													

			HOLDING TIME			CONTAMINANT		GENERAL COMMENTS
LAB	SITE	SAMPLE				FLD	PREP	BLANK CONTAMINATION
NUMBER	IDENTIFICATION	TAKEN	HG PREP	CN-	OTHERS	(Y/N)	(Y/N)	SAMPLE SPECIFIC FLAGS
4969011	8-SL-MW3-1 (1-3')	11/28	NA	NA	NA	N	N	
4969012	8-SL-MW3-2 (3-5')	11/28	NA	NA	NA	N	N	
4969013	8-SL-MW2-1 (1-3')	11/28	NA	NA	NA	N	N	
4969014	8-SL-MW2-2 (3-5')	11/28	NA	NA	NA	N	N	
4969015	8-SL-MW1-1 (1-3')	11/28	NA	NA	NA	N	N	
4969016	8-SL-MW4-1 (1-3')	11/28	NA	NA	NA	N	N	
4969017	8-SL-MW1-2 (3-5')	11/28	NA	NA	NA	N	N	
4969018	8-SL-SB5-1 (1-3')	11/28	NA	NA	NA	N	N	
4969019	8-SL-SB5-2 (3-5')	11/28	NA	NA	NA	N	N	
4969020	BK-SL-1 (1-2')	11/28	12/11	NA	NA	N	N	
4969021	BK-SD-1	11/28	12/11	NA	NA	N	N	
4969022	DG1-SD-1	11/28	12/11	NA	NA	N	N	
4969023	DG2-SD-1	11/28	12/11	NA	NA	N	N	

TABLE 4.3; QA/QC DATA FOR SELECTED INORGANIC METALS ANALYSIS

MATRIX

: 9 LOW WATERS

CASE NUMBER

: 14996

LABORATORY

: CH2M Hill/MOMTGOMERY AL

LABORATORY	: CH2M HIII/MOMTGOMERY AL													
PERFORMANC	E QA/QC													
INITIAL CALIBRATION							ICAL BLANK							
MULTIPOINT ICAL NOT PROVIDED							NONE							
ICAL VERIFICATION MET CRITERIA CONTINUING CALIBRATION CCAL VERIFICATION MET CRITERIA														
							PREP BLANK							
							Pb (50.1 ug/l)							
														
INTERFERENCE CHECK SAMPLE							CONTINUING BLANK							
ICS MET CRITERIA							NONE							
		CRDL	IDL	LCS REC	OVERY	SPIKE F	RECOVERY	(%)	DUP. PRI	ECISION	SER.DIL.	PREP BLK		
ELEMENT	METHOD	(ug/l)	(ug/l)	(%)	LIMIT	PRE	LIMIT	POST	(%RPD)	LIMIT	(%D)	(ug/l)		
СНВОМІИМ	ICP	10	5.5	92.1	80-120	105.0	75–125	95.3	23.3	+/-20%	NA	NA		
IRON	GFAA	100	25.0	92.3	80-120	596.5	75–125	96.4	20.2	+/-20%	NA	50.1		
LEAD	GFAA	5	9	105.5	80-120	58/ 93	75–125	106/97	16.1/0.0	+/-20%	NA	NA		
FLAGS				NO		YES			NO		NO	NO		
SAMPLE QA/Q	5			Katib	r v Miler i fige r v jaki s							1.		
								CONTAM	INANT	GENERA	COMMEN	ITS		
LAB		SITE			HOLDING TIME			FLD	PREP	BLANK CONTAMINATION		TION		
NUMBER	IDENTIFICATION			TAKEN	HG PREP	CN-	OTHERS	(Y/N)	(Y/N)	SAMPLE	SPECIFIC I	FLAGS		
14996001	3E-GW-MW1	3E-GW-MW1			NA	NA	NA	N	N					
14996002	2-GW-WP13			12/04	NA	NA	NA	N	N					
14996003	2-GW-WP12			12/04	NA	NA	NA	N	N					
14996004	TRAVEL BLA	12/04	NA	NA	NA	N	N							
14996005	1-GW-MW1 12/05				NA	NA	NA	N	N					
14996006	1-GW-MW2	NA	NA	NA	N	N								
14996007	POTABLE DE	POTABLE DECON WATER C.E.4				NA	NA	N	N					
14996008	2-GW-WP13	NA	NA	NA	NA	N	N							
14996009	2-GW-WP12	NA	NA	NA	NA	N	N							
l														

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5.0 CONCLUSIONS

The data were reviewed and validated using HAZWRAP Level C Validation Guidelines supplemented with EPA Functional Guidelines. The data are acceptable with qualifications as noted.

6.0 REFERENCES

- 1. Hazardous Waste Remedial Actions Program Requirements for Quality Control of Analytical Data. August 1988.
- 2. U.S. EPA. Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses. 1988 revision.
- 3. U.S. EPA. Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses. 1988 revision.
- 4. U.S. EPA. Contract Laboratory Program Statement of Work for Organic Analyses. 1988 revision.
- 5. U.S. EPA. Test Methods for Evaluating Solid Waste (SW-846), Third edition. September 1986.
- 6. U.S. EPA. Contract Laboratory Program Statement of Work for Inorganic Analyses. 1988 revision.

GLT949/025.50

TO:

Becky Svatos/GNV

FROM:

Ann Castleberry/MGM

DATE:

December 3, 1990

SUBJECT:

Data Validation for Jacksonville ANG Site Investigation

PROJECT: GNV27267.JX.RI

This memorandum summarizes the results of the data review and validation for Sample Delivery Group 17211. Overall, the data are acceptable and can be used without any qualifications.

All the samples were analyzed within the 6-month holding time. The results are summarized below. All the total (unfiltered) results are greater than the dissolved (or unfiltered) values; after the samples were filtered, no chromium was detected above the instrument detection limit.

Field Point	Total (µg/l)	Dissolved (µg/l)
MW 6-1	9.9 B <i>U</i>	3.3 U
MW 6-2	19.6 U	3.3 U
WP 6-4	286	3.3 U
WP 6-5	32.6 U	3.3 U
WP 6-6	1,650	3.3 U
Equipment Blank	10.4	
Field Blank	7.2 B	
Method Blanks	3.3 U	
Duplicate Sample	3.3 U	

For inorganic results, the B qualifier means that the sample result is greater than the instrument detection limit, but less than the contract required detection limit. As a result, the chromium detected in the field blank may have minimum impact on the sample results, but the equipment blank value should be considered. As with organic results, if a target analyte is present in any blank, then the sample results may be qualified. The U.S. Environmental Protection Agency states in the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses (1988) that:

> "Action in the case of unsuitable blank results depends on the circumstances and origin of the blank. Sample results in excess

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of the instrument detection limit but less than five times the amount in any blank should be qualified as (U)."

Multiplying the equipment blank value of 10.4 by 5 yields 52. The qualifier is, therefore, applied to three of the sample results, as indicated in the table by italicized U's.

Initial and continuing calibration verification is acceptable. Both the initial and continuing calibration sample percent recovery are within the 90 to 110 percent target recovery window.

Blanks are acceptable. No values of the target analyte were detected above the instrument detection limit.

ICP interference check sample is acceptable. Both the initial and final percent recovery are within the 80 to 120 percent target recovery window.

Pre- and post-digestion spike recoveries are acceptable. Both recoveries are within the 75 to 125 percent target recovery window.

Duplicates are duplicate laboratory samples rather than duplicate field samples. Both filtered and unfiltered samples were duplicated. As would be expected, the duplicate of the filtered sample was zero. The duplicate of the unfiltered sample was also zero (below the detection limit). This result is not unexpected, as the native sample result was less than the contract required detection limit and the samples contained sediment. Therefore, the duplicate results are acceptable and do not influence the usability of the data.

The laboratory control sample is acceptable, because the percent recovery is between the target limits of 90 to 110 percent. In regard to the control chart and the corrective action note at the end of the data package, be aware that a new ICP calibration standard (which included chromium) was prepared 10 days before this sample was analyzed. Control chart limits naturally change slightly after a new calibration standard is introduced. Since 11 data points are needed to define a control chart, and 11 new ones have not been produced using the new calibration standard, the control chart reflects the change from "old" to "new" rather than only the new calibration standard. Therefore, the laboratory control sample percent recovery for this specific sample batch may be outside the lower control limit of the control chart, but it is within the CLP target limits of 90 to 110 percent and is therefore acceptable.

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Instrument detection limits (quarterly) are acceptable. This form simply establishes the laboratory-specific instrument detection limit for chromium. An instrument detection limit of 3.3 μ g/l was used on all the sample result forms.

ICP interelement correction factors (quarterly) are acceptable.

ICP linear ranges (quarterly) are acceptable. The form states that the sample results fall within the instrument linear range for this analysis.

APPENDIX G Risk Assessment Methodology

Appendix G RISK ASSESSMENT METHODOLOGY

EXPOSURE ESTIMATION

Exposure is defined as the contact of an organism with a chemical or physical agent. In this assessment, exposure is normalized for time and body weight. Exposure normalized for time and body weight is termed "intake." Chemical intake is expressed as mg chemical/kg body weight-day.

GENERIC ESTIMATION OF INTAKE

Equation G-1 presents a generic equation for calculating chemical intake.

$$I = (C \times CR \times EF \times ED) \div (BW \times AT)$$
 (G-1)

where:

I = Chemical intake (mg/kg body weight-day)

C = Chemical concentration (e.g, mg/l)

CR = Contact rate (e.g., liters/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

Carcinogens

A lifetime average intake (or chronic daily intake) of the chemical is estimated for carcinogens as a means of prorating the total cumulative intake over a lifetime. An averaging time of 75 years is used for carcinogens.

Intake can change over a lifetime as body weight, contact rate, exposure frequency, and chemical concentrations change. Equation G-1 can be modified to address this issue:

$$I = (1/AT) \sum_{i=1}^{M} (C_i \times CR_i \times EF \times ED) \div BW_i$$
 (G-2)

where:

I = Chronic daily intake of the chemical (mg/kg body weight-day)

C_i = Chemical concentration in ith time period (e.g, mg/l)

 $CR_i = Contact rate in ith time period (e.g., liters/day)$

 $EF_i = Exposure frequency in ith time period (days/year)$

M = Number of time periods

ED = Exposure duration in ith time period (years)

 $BW_i = Body$ weight in ith time period (kg)

AT = Averaging time (days)

The U.S. Environmental Protection Agency (EPA) typically assumes a constant body weight (typically 70 kilograms) in estimating lifetime cancer risk. This assumption would alter equation G-3 to yield the following:

$$I = 1/(AT+BW) \sum_{i=1}^{M} (C_i \times CR_i \times EF \times ED)$$
 (G-3)

Non-Carcinogens

The chemical intake of non-carcinogens is estimated over the appropriate exposure period or averaging time. The averaging time selected depends on the toxic endpoint being assessed.

When evaluating exposures to developmental toxicants, intakes are calculated by averaging over the exposure event (e.g., a day or single exposure incident). For acute toxicants, intakes are calculated by averaging over the shortest exposure period that could produce an effect, usually an exposure event or a day. For both situations, it can be assumed that the averaging time and the exposure period are equal. Therefore, equation G-1 can be simplified to:

$$I = (C \times CR) \div (BW) \tag{G-4}$$

where:

I = Chemical intake (mg/kg body weight-day)

C = Chemical concentration (e.g, mg/l)

CR = Contact rate (e.g., liters/day)

BW = Body weight (kg)

When evaluating exposure to non-carcinogenic systemic toxicants, intakes are calculated by averaging intakes over the period of exposure. The averaging time used is no longer than a year and may conservatively be estimated to be a day. In the latter situation, intake can be estimated using equation G-4.

MEDIA-SPECIFIC INTAKES

The methodology for estimating intake from specific environmental media is presented in Section 6 of the draft report.

CARCINOGENIC RISK ESTIMATION

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The cancer potency factor or slope factor (SF) converts estimated daily chemical intakes averaged over a lifetime of exposure directly to incremental risk.

To estimate risks from exposure to carcinogens, the following is needed:

- Chronic daily intake of the chemical
- · Carcinogenic potency factor

ESTIMATING CANCER RISKS CAUSED BY EXPOSURE TO A SINGLE CARCINOGEN

The one-hit equation can be used to describe excess lifetime cancer risk from exposure to a carcinogen. This model can be described by the following equation:

$$Risk = 1 - exp^{-(SF \times CDI)}$$
 (G-5)

where:

Risk = Excess lifetime cancer risk as a unitless probability

exp = The exponential 2.71828

SF = Slope factor or cancer potency factor (mg/kg-day)⁻¹

CDI = Chronic daily intake averaged over a lifetime (mg/kg-day)

Where the risks are low (risk $< 10^{-3}$), it can generally be assumed that the dose-response relationship will be in the linear low-dose portion of the multi-stage model dose-response curve. Under this assumption, the slope factor is a constant and risk is directly related to intake. This can be described as:

$$Risk = SF \times CDI \tag{G-6}$$

ESTIMATING CANCER RISKS CAUSED BY EXPOSURE TO MULTIPLE CARCINOGENS

To assess the potential for carcinogenic effects posed by exposure to multiple carcinogens, it is assumed in the absence of information on synergistic or antagonistic effects that carcinogenic risks are additive. This approach is based on EPA's

Guidelines for Health Risk Assessment of Chemical Mixtures (1986) and Guidelines for Cancer Risk Assessment (1986).

For estimating cancer risks from exposure to multiple carcinogens from a single exposure route, the following equation is used:

$$Risk_{T} = \sum_{i=1}^{N} Risk_{i}$$
 (G-7)

where:

Risk_T = Total cancer risk from route of exposure Risk_i = Cancer risk for the ith chemical

NON-CARCINOGENIC RISK ESTIMATION

COMPARISON OF INTAKE TO REFERENCE DOSE

The potential for non-carcinogenic health effects from exposure to a contaminant is evaluated by comparing an exposure level over a specified time period with a reference dose for a similar time period. This ratio of exposure to toxicity is called a hazard quotient and is described below:

$$HQ = E \div RfD \tag{G-8}$$

where:

HQ = Noncancer hazard quotient

E = Exposure level (or intake in mg/kg-day)

RfD = Reference dose (mg/kg-day)

This comparison can be interpreted as follows:

HAZARD INDEX APPROACH

Exposure situations may involve the potential exposure to more than one chemical. To assess the potential for non-carcinogenic effects posed by multiple chemicals, a hazard index (HI) approach can be used. This approach, which is based on EPA's Guidelines for Health Risk Assessment of Chemical Mixtures (1986), assumes dose

additivity and sums the ratios of the daily intakes of individual chemicals to their reference doses, as shown below:

$$HI = E_1/RfD_1 + E_2/RfD_2 + ... E_i/RfD_i$$
 (G-11)

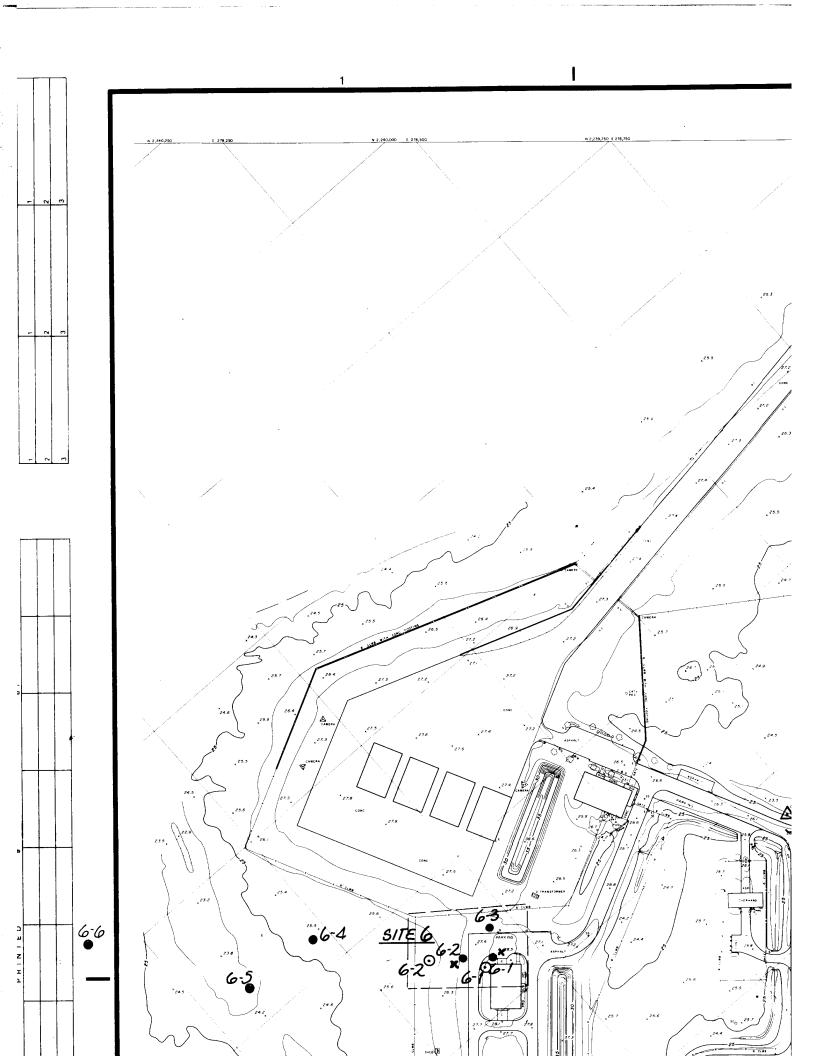
where:

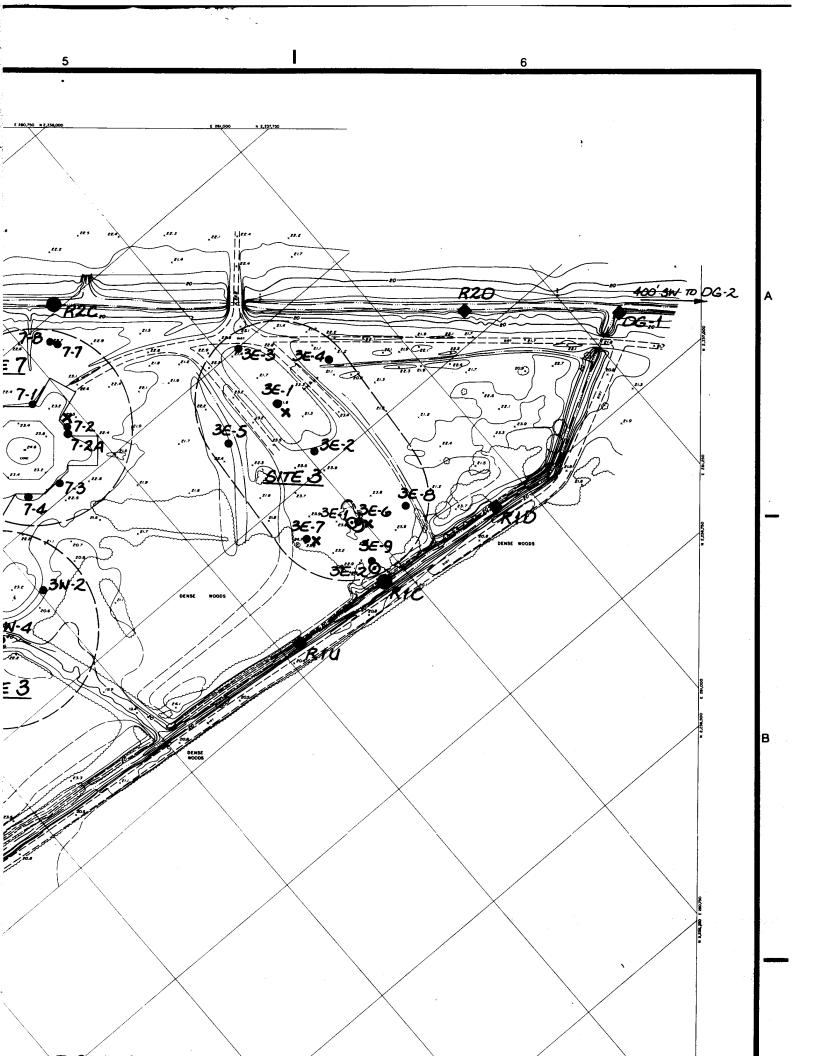
HI = Hazard index

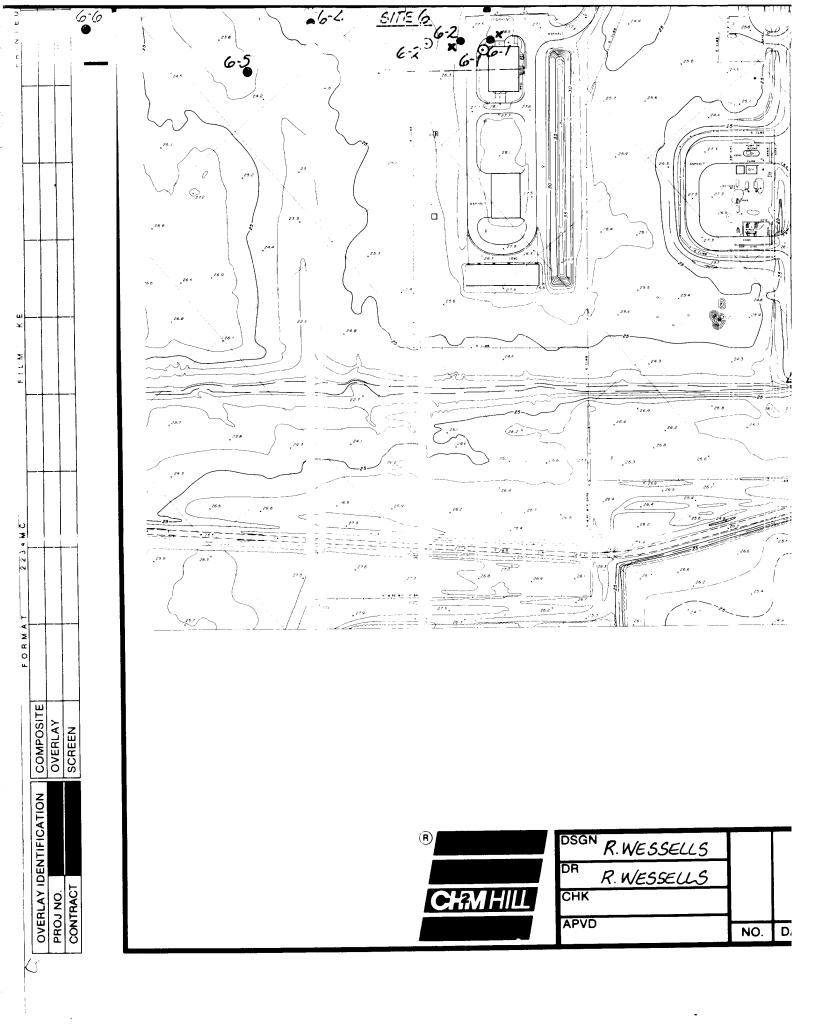
E_i = Daily intake of the ith chemical (mg/kg-day) RfD_i = Reference dose of the ith chemical (mg/kg-day)

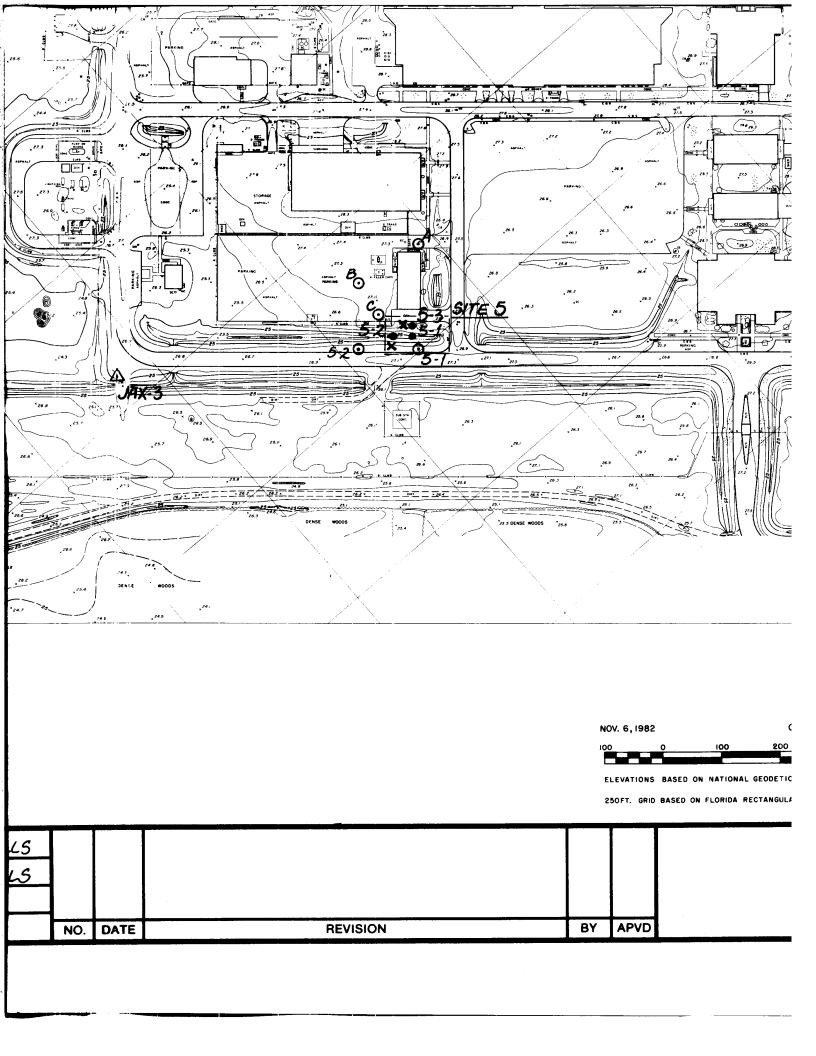
An HI that exceeds 1 is a numerical indicator of the transition between acceptable and unacceptable exposure levels, and there may be concern for potential health effects. Any single chemical with an estimated daily intake greater than the corresponding reference dose will cause the HI to exceed 1.

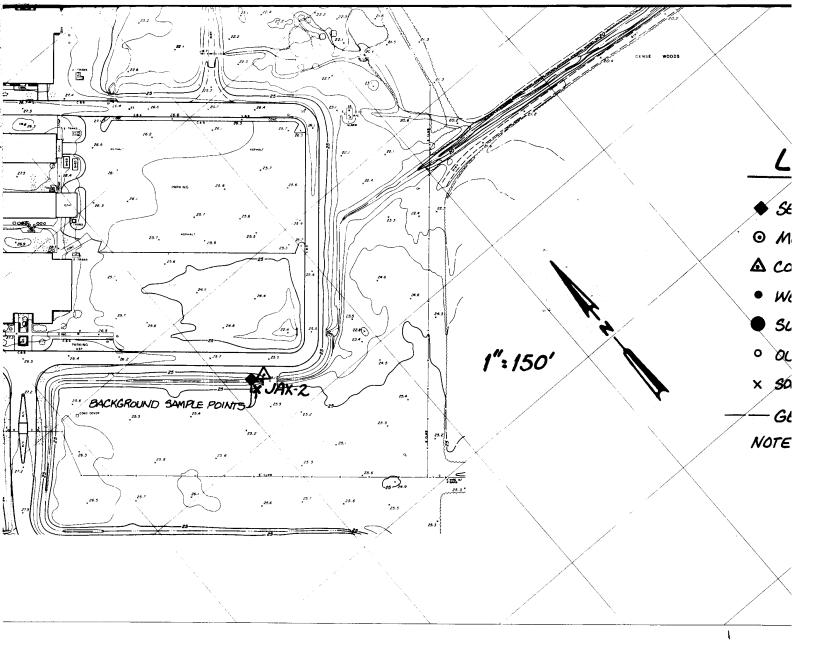
For multiple chemical exposures, the HI can exceed 1 even if no single chemical exposure exceeds the reference dose for that chemical. The assumption of additivity is most properly applied to chemicals that induce the same effect by the same mechanism or in the same target organ. If the HI is near or exceeds 1, the chemicals in the mixture are segregated by critical effect or target organ and separated indices are derived for each effect or target organ. If any of these separate indices exceed 1, then there may be a concern for potential health effects. Chemicals that are essential nutrients are excluded from the index when in the range of essentiality.











CONTOUR INTERVAL I FT.



ONAL GEODETIC VERTICAL DATUM OF 1929.

DA RECTANGULAR GRID SYSTEM.

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING.

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY. 125™ FIGHTER INTERCEPTOR GROU FLORIDA AIR NATIONAL GUARD JACKSONVILLE, FLORIDA

LEGEND

- SEDIMENT SAMPLE LOCATION
- O MONITOR WELL
- A CONTROL POINT (YERT NGVD , HORIZ = STATE PLANE COORD.)
- · WELL POINT
- SURFACE WATER & SEDIMENT SAMPLE LOCATION
- · OUTFALL WATER AND/OR SEDIMENT SAMPLE LOCATION
- X SOIL SAMPLE LOCATION
 - -GENERAL SITE OUTLINE

NOTE: BASE MAP FROM F.A.N.G. DATED NOVEMBER 6, 1982

' GROUP 'JARD

SAMPLE LOCATIONS
FOR THE SI

SHEET

DWG

DATE DEC. 1989

PROJ NO. GNV 27267.JX